

The American Midland Naturalist

Devoted to Natural History, Primarily
that of the Prairie States

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The American Midland Naturalist

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JANUARY, 1927.

NO. 7.

THE HITCHCOCK LECTURE UPON ICHNOLOGY, AND THE DARTMOUTH COLLEGE ICHNOLOGICAL COLLECTION.†

Edited by N. M. Grier.*

Des Moines University,

Des Moines, Iowa.

FOREWORD.

Charles Henry Hitchcock was Professor of Geology and Mineralogy in Dartmouth College from 1868 to 1908, and Professor Emeritus from that time until his death in Honolulu, November 5, 1919. During that period he was also State Geologist of New Hampshire from 1868 to 1878; lecturer in Geology at Mount Holyoke College for part of each year from 1870 to 1896, and taught Geology and Zoology at Williams College and in the Virginia College of Agriculture and the Mechanic Arts in 1880 and 1881. He received the honorary degree of Ph. D. from Lafayette College in 1870, and that of LL.D. from Amherst College in 1896.

The son of a distinguished geologist and college president, and of a mother notable for scholarly attainments, he enjoyed exceptional educational advantages at home, and at school received the best preparatory education provided at that time. He studied for the ministry three years at Yale and at the Andover Theological Seminary, and just before coming to Dartmouth spent a year of professional study in the Royal School of Mines, London.

Professor Hitchcock was one of the pioneer geologists of America. His field work was largely in New Hampshire, Vermont, and Maine, but it extended at times into the western and southern states, into Canada and to the Hawaiian Islands. He was chiefly interested in the glacial geology of the Champlain valley, and in the White Mountains, in fossil footprints and in volcanoes. He wrote voluminously on these subjects, and in a less exhaustive way, on many others. He was an indefatigable collector, his collections forming an enduring monument to

* Contribution from the Department of Geology and Geography, Dartmouth College.

† Paper on the program of the Paleontological Society of America at the University of Wisconsin, December 1926.

his memory in the college museum, of which he was curator during his active term of service. He was one of the founders of the Geological Society of America, of the Appalachian Mountain Club, and of the International Congress of Geologists, and in 1870-71 established the first meteorological station on the summit of Mount Washington.

For 30 years Professor Hitchcock was one of the outstanding personalities of the old and new Dartmouth. His scholarship was a notable asset to the college; his steadfast Christian character and ever ready services, an asset to the community. His enthusiasm and knowledge of his subject commanded the affectionate allegiance of those who already felt the call to devotion similar to his own; his kindly nature and gentle discipline drew to his classrooms, in lighter vein, many generations of Dartmouth men who caught there something of his spirit of sincerity and love of truth, and who gained an interest in Geology that could not have been otherwise vouchsafed to them.* Before his death, Professor Hitchcock deposited with the Department of Geology and Geography, the lecture on Ichnology. It is now reproduced on account of the quaint sidelights it throws on the man, and the branch of paleontological science so closely associated with his name.

I.—THE LECTURE.

In the year 1800 a student of Williams College was ploughing his father's field at South Hadley, Massachusetts, when he turned up a stone bearing upon its surface the imprint of birds' feet. It was not a strange sight for him to see the foot-marks of animals in the mud upon the shores of rivers or upon the highway, but he had never before seen the imprint of an animal's foot upon the solid rock. He had been taught that ledges had been suddenly called into being by the Almighty without passing through a tedious formative process. Here, however, was a phenomenon not to be explained in concordance with popular opinion. It was before the days of Geology, but Pliny Moody exercised a common sense method of explaining what he saw, for he concluded that these markings were made in an early period of the earth's history. Nothing was more natural than to surmise that they were made in the first aqueous deposit of which he had knowledge—the muddy sediment left by the Noahan

* From the Dartmouth Alumni Magazine, Vol. 12, p. 696. A memorial to Professor Hitchcock is also printed in the Bulletin of the Geological Society of America 31: 64-70.

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Deluge. Hence he pointed out these markings to his friends—the specimen having been utilized as a stepping stone at his front door—as having been made by Noah's raven when wandering in search of dry land. The slab is still preserved and the impressions appear to have been made by one of that remarkable group of animals that abounded in New England during the Triassic period.

In March 1835, W. W. Draper in returning home from church passed the house of Wm. Wilson in Greenfield, Massachusetts. Some slabs about to be placed on the sidewalk leaned against the fence. A light snow upon them happened to slide off suddenly as he passed and he saw these same impressions—and remarked to his wife—"there are some turkey tracks made 3,000 years ago." This was a strictly philosophic deduction from the facts—corresponding perfectly to the deductions of Moody. Mr. Draper showed them to Mr. Wilson. Mr. Wilson exhibited them to Dexter Marsh, a stonecutter who afterwards gathered a very celebrated collection of these objects. Marsh spoke to Dr. James Deane the village physician, and Dean wrote to my father asking him as the State Geologist of Massachusetts to come and examine them and he did so.

The numerous researches demanded for the understanding of these fossil footmarks has given rise to a science which has received from Dr. Buckland the name *Ichnology*, or the science of tracks. And we may call each individual track an *ichnite*, to borrow the terminology of the science. Animals known to exist because of their tracks may be termed ICHNOZOA.* Ichnology has history. The first genuine tracks on stone ever described were those of tortoises and small reptiles in the New Red Sandstone of Scotland on the estate of Sir Wm. Jardine. They were described by Rev. Dr. Duncan in the Transactions of the Royal Society of Edinburgh, in 1828. Since then Sir Wm. Jardine has more fully described them in a splendid folio entitled the "Ichnology of Annandale." Dr. Buckland early distinguished himself by

* It is of course impossible to determine with certainty the systematic positions of all the animals which made the tracks.

attention to these tracks, and having performed some experiments upon living tortoises, some of the conductors of the literary journals who supposed the whole matter to be visionary thought the occasion a good one for witticism. A sprightly sally, (*jeu d'esprit*), of this kind that appeared in Newton's Journal for April 1828 contains too many good points to be lost, and I will read it.

FOSSIL REMAINS

"It will be remembered that the Rev. Mr. Buckland distinguished himself a few years ago by discovering a cave at Kirkdale which he proved to be the dining room of antediluvian hyenas, that had in this retreat feasted upon elephants and water-rats, and left nothing but the teeth of these titbits as records to their good living and bones of contention for future naturalists and cosmogonists. The same ingenious gentleman has lately had the good fortune to find a piece of red sandstone bearing on it the traces of an antediluvian tortoise's footsteps. The whole Geological world has been in raptures at this discovery, and in order to make sure of the fact that the steps traced in the stone were the steps of a tortoise, a meeting of the Society was held, and some soft chalk was prepared on which a modern tortoise might make his mark, and thus authenticate as it were the signature of his predecessor.

"Everything being ready for the demonstration, and the interest of the scientific company wound up to the highest pitch, the tortoise was placed on the chalk, and first of all he flatly refused to stir a step. The members upon this very properly waxed impatient, got in a rage, and began kicking and banging him about in an extremely moving manner. They had much better however have refrained from these stimulants for when the tortoise was at last prevailed upon to walk, he insisted on walking as straight as an arrow, whereas the antediluvian tortoise's march was as crooked as a ram's horn. The Society were aghast at the discrepancy. Various arguments, however, were used to console them. It was suggested that the tortoise might have forgotten the true

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manner of walking while confined in the ark, and that owing to this circumstance the proper step might have been lost by its descendant; or it might be that chastened by the deluge, his slow race had returned to the path of rectitude, which they had in the universal degeneracy willfully deserted for devious ways. Or perhaps they had one way of walking on red sandstone, and another on soft chalk; one manner in private, and another before scientific beholders."

In 1834 some tracks were found in Germany, and were called by Prof. Kaup the *Cheirotherium*—the hand animal—because the foot resembled a human hand. The same tracks and also the bones of the skull having been found in England, the animal was restored, and was called the *Labyrinthodon*. It was a Batrachian and a drawing of a large frog will convey some idea of the appearance of the original. Up to this time, 1835, very little attention had been paid to the subject of footmarks. If questioned as to the existence of the impression of the feet of animals upon stone, almost any geologist of that day would have remarked, "*it is claimed by some that such a thing is possible, but it is really uncertain whether the facts are properly represented.*"

In 1835, and before the account of the German footmarks had reached this country, my late honored father, at one time President of Amherst College in Massachusetts, saw certain impressions upon flagging stones in Greenfield, which wonderfully resembled the tracks of birds. To see the impressions of birds upon the solid rock, and especially to find traces of the existence of warm-blooded animals so low down in the formations among obscure clams and frigid fishes, was something far in advance of all the information acquired up to that time. Yet here were the three-toed impressions, and the succession of steps, the right and left feet, and the conviction was irresistible that they were genuine evidences of the existence of birds down in the New Red Sandstone. But to feel this truth, and to convince the world of it, were very different things; for one must see in order to believe, and slabs of stone cannot be carried to everyone's fireside

like a pamphlet. Accordingly the summer of 1835 was spent in the examination of all the quarries in the Connecticut valley, to see if the slabs of Greenfield alone exhibited the impressions; museums and menageries were visited to examine the forms of the feet of birds and other animals; and libraries were scanned in search of facts from foreign sources. As the result of this investigation there appeared in the January number of the American Journal of Science and Arts (1836) an account of seven species of footmarks, called *Ornithichnites*, or stony bird tracks.⁽²⁾ This was the first publication in this country upon this subject, followed five years later in the Final Report on the Geology of Massachusetts of 32 different kinds,⁽³⁾ some of them quadrupeds as well as birds. But these new ideas met with violent opposition and even ridicule from the public, and especially from the Geologists. A committee of five of the most learned members of the American Association of Geologists and Naturalists were deputed to visit this discoverer, his quarries and specimens, and though those most opposed to the new doctrine were members of the committee, their report stated "that the evidence entirely favors the views of Prof. Hitchcock and they regret that a difference had existed, if they did not feel assured it would lead to greater stability of opinion." The public acquiesced in the report, and since that time, after seven years of opposition, the world has accepted the fact of a new principle discovered, have applauded the author, and have aided his researches by liberal contributions.*

Animated by the enthusiasm of discovery, the original expounder of the bird-tracks for a subsequent period of twenty years, as long as life continued, collected specimens, described them in the publications of learned societies, and amassed a multitude of facts about the progression of living animals.

(2) 1836. Hitchcock E. *Ornithichnology*. Description of the Footmarks of Birds. (*Ornithichnites*) on New Red Sandstone in Massachusetts. Amer. Journal Science XXIX. pp. 307-40, pl. I, Fig. 1-201 23-24; pl. II. No. 2, 21-22, pl. III.

(3) 1841. Hitchcock E. *Final Report on the Geology of Massachusetts*, Pt. III, pp. 301-714, pls. XV-LI. Amherst and Northampton.

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Three important publications appeared from his pen describing the footmarks: first in 1848,⁽⁴⁾ when 52 varieties were figured and described; next in 1858,⁽⁵⁾ when the Legislature of Massachusetts came nobly forward and issued a quarto volume, containing a complete exposition of the whole subject, a volume of 232 pages and 60 plates, and descriptive of 119 species; and lastly a supplement to the same, issued by the same government in 1865, bringing up the number of species to 150.

From the very first the attempt was made to accumulate slabs of footmarks in a museum. Up to 1853 the effort was single and unaided. At that time the occasion of the sale of a large collection of slabs led to contributions from friends, continued from time to time for ten years. Only the results need be stated: contributions to the extent of \$11,500, a building 100x40 feet containing 20,000 impressions of the feet of animals upon a great variety of slabs placed at every angle in order to secure the advantage of the best light. This museum, named after its founder since his decease, is the only building in the world entirely devoted to the subject of Ichnology.* Its fame extends to all countries, and the institution to which it now belongs, is known abroad largely on account of this collection committed to their care. Those who would become acquainted with the science of Ichnology

(4) 1848. Hitchcock E. An attempt to disseminate and describe the animals that made the fossil footmarks of the United States and especially of New England. Mem. Amer. Acad. Arts and Sciences. (2) III., pp. 129-256, pls. 1-24.

(5) 1858. Hitchcock E. Ichnology of New England. A report on the sandstone of the Connecticut Valley, especially its fossil foot marks. Boston.

1865. Hitchcock E. Supplement to the Ichnology of New England, Boston.

* For a list of Professor C. H. Hitchcock's publications compiled by himself up to the year 1907, see the Bulletin of the Geological Society of America 31:70-80, 1920.

* The Appleton Ichnological Cabinet at Amherst College, Amherst, Massachusetts.

† Professor Hitchcock's constant references to these caused him to be nicknamed "Type" by his students.

must visit it, as it contains the types† of all the descriptions, and specimens of every variety known in the Connecticut Valley. It is one of the best instances in this country of a museum devoted to one definite and limited branch of knowledge, but containing in profusion all objects needed to illustrate the minutest details. It is by the multiplication of these illustrations of single ideas, that science will progress and the world be benefitted.

It will be proper now to state the manner in which these *ichnites* occur. They occur in the middle of the Connecticut River Sandstone over a distance of 80 miles from Gill, Massachusetts, to Portland, Connecticut, generally upon fine micaceous shales. Upon cleaving the strata, the *ichnites* are seen depressed upon the lower layer, while the upper layer has upon its under surface the casts of the depressions. Among the many thousand specimens exhumed not one has been an exception to this rule. If we can place ourselves in imagination upon this ancient shore we can see the process of forming the tracks. We stand upon the shore of an estuary running inland from Long Island Sound. The tide just fallen has deposited a layer of soft mud. The birds and reptiles emerge from their hiding places and frequent the shore for food. They tread upon the mud and return. The heat of the tropical sun hardens this trodden surface, and the tide deposits another layer. The second layer in turn receives the impression of feet, is hardened and covered. Or the birds may have assembled at the mouth of a small river. A flood has distributed mud upon its banks. Trodden upon and hardened by the same agencies these also are changed into stone and preserved for the Geologist. Sometimes the layers formed so rapidly that to the depth of several inches they retain their softness. Then the impression extends through several layers, and when cleaved the lowest impression may be partial, e. g., in a bird's foot only the middle toe made a mark. Thus an inexperienced observer might ascribe the impression upon the lowest layer to an animal very different from the one who trod the upper surface.

These impressions could not have been made beneath the water because in connection with them are found the prints of rain drops. The drops have each left a round impression which completely cover the surface. They are preserved most perfectly when it barely sprinkles. In a heavy or long continued shower, so many impressions are made that they coalesce and leave no distinct trace of their existence, and resemble a chopped sea. Thus there are found specimens denoting every variety of shower—from sprinkling of fine drops to the thunder storm. There are the large drops of a passing cloud, and the wind that drove the cloud caused the drops to impinge at an acute angle and thus elongate the impression in the direction of the wind. Here then we have the weathercock and rain gauge of geologic days, which record with certainty the direction and force of the wind and the amount of rain that fell. Different layers indicate a difference in the direction of the wind. Surely then in these primitive times there were changes in the weather from wet to dry just as now. Sometimes the impressions of the minutest striae and papillae of the foot are preserved—such delicate impressions that a lens is needed to distinguish the marks. The tracks of small insects are numerous—hundreds upon a square foot of surface. To retain such delicate impressions as the feet of flies and beetles the mud must have been very soft and very quickly hardened by a tropical sun so that the overflowing waters would not obliterate the impressions. Indeed the character of the animals and of the vegetation is entirely tropical.

This manner of formation of the tracks and of the strata shows why scarcely any remains of the animals beside their tracks are found. The shore seems to have been the common feeding ground. Consequently if any of them died there, their remains would probably have been devoured or floated away by the water. Such a spot therefore is the least likely of any to contain organic remains.

In describing these animals of the sandstone from their tracks it is important to know what characters can be derived from their feet. Let us take known animals. Man's foot is different from the foot of every other animal—the short toes

distinguish it from the foot of the ape, the nearest approach of the animal kingdom to man. How different birds' feet are from quadrupeds—tortoises, frogs, lizards, and caterpillars. In fact there is not a single class of animals that does not have some peculiarity in its feet which may be generally noticed. By comparing the size of modern animals with their tracks we have multipliers for each class, and can therefore estimate the size of these early birds.

Cuvier has finely described the definiteness and certainty with which we can infer the character of an animal from its track, although when he wrote fossil footmarks were unknown. "Anyone," says he, "who observes merely the print of a cloven hoof may conclude that it has been left by a ruminant animal, and regard the conclusion as equally certain with any other in physics or morals. Consequently, this single footmark clearly indicates to the observer the forms of the teeth, of all the leg bones, and of the trunk of the body of the animal which left the mark. It is much surer than all the marks of Zadig."

There are certain characters that are constant and distinctive in the feet of animals and in their mode of progression which are used in learning the nature of the animals. Thirty of them are given of which I will mention a few. These are the number of feet, mode of progression, length of step, webbed feet, number of toes, angles of the toes with each other, position of the hind toe, the claw, number and length of the phalangeal impressions, the form and position of the heel, under side of the foot—even or irregular, character of the integuments—pitted, ridged, or convoluted, character of the caudal appendages. Guided by these principles I made the following classification of the species of Ichnozoa in 1888—

- 1 Marsupial.
- 17 Biped Animals with pachydactylous feet.
- 18 Biped Animals with leptodactylous feet.
- 27 Dinosaurs.
- 28 Reptiles.
- 16 Amphibians.

- 6 Chelonians.
- 4 Fishes.
- 24 Insects.
- 16 Crustacea and inferior Arthropods.
- 5 Molluscs.
- 6 Uncertain.

178 Species

ARCHAEOPTERYX

First evidence of the existence of a bird in the Jurassic series was afforded by the impression of a single feather on the lithographic stone of the famous quarry at Solenhofen in Bavaria. It was described with great minuteness by Herman Von Meyer in 1861. He applied to it the name of *Archaeopteryx lithographica* or *ancient bird of the lithographic stone*. A few months later Professor Andreas Wagner communicated to the Royal Academy of Science of Munich the discovery in the same quarry of the greater part of the skeleton of an animal with feathers. Without having seen the specimen, Professor Wagner conceived that the animal was a peculiar flying reptile, long known in that formation by the presence of its bones, and called it *Gryphosaurus*. The specimen afterwards came into the possession of the British Museum in London, and was very completely examined and described by Professor Owen, who perceived that its feathers were like the single one described by Von Meyer, and therefore he retained the former name, besides establishing fully the ornithic relation of the animal. It approaches nearest to the birds represented by the living raven, owl and falcon. The wing extremities are not different from those of the falcon, except it has no free fingers and the wrist bones are not so much ankylosed. There are five living birds possessing one or two free claws. The pterodactyl has four. There are four toes in the *Archaeopteryx* of which the two first are consolidated as in all birds. In the pterodactyl these two coalesce and are enormously lengthened as in bats, for the support of the flying membrane. The bones of the feet are

precisely like those of "Incessores." There are three toes directed forward and one behind. Its tarso-meta-tarsal is consolidated as in all birds, and unlike those of pterodactyls.

Archaeopteryx has 20 caudal vertebrae, a young ostrich has 18-20, an embryonic rook, ten. The first five of these vertebrae show transverse processes, progressively diminishing in length and breadth. The length of the 1st caudal is $3\frac{1}{2}$ lines; increasing to 6 lines in the eighth vertebrae, the same length to the sixteenth when they diminish to the last, which is five lines long. Each vertebrae has a pair of feathers attached one on each side. The principal ones diverge from the central line at an angle of 40 degrees, becoming more acute at the extremity. The tail was 11 inches long, expanding gradually to a width of $3\frac{1}{2}$ inches beyond the last bone, while the end was obtusely rounded out, and shaped like a squirrel's tail. The first feathers, one inch in length, increase to five inches in the 15-17th pairs, and then diminish to 3 inches and 8 lines. The quill feathers of the wings were 6 inches in length and 1 inch in width. Their arrangement was similar to that of living birds.

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THE SANDSTONE BIRD

By Edward Hitchcock

Scene—Banks of the Connecticut River.
Geologist alone examining the footmarks of a bird.

(*Ornithichnites giganteus*)

Foot-marks on stone! how plain and yet how strange!
A bird track truly though of giant bulk,
Yet of the monster every vestige else
Has vanished. Bird, a problem thou hast solved
Man never has: to leave his trace on earth
Too deep for time and fate to wear away.
A thousand pyramids had mouldered down
Since on this rock thy footprints were impressed;
Yet here it stands unaltered though since then,
Earth's crust has been upheaved and fractured oft.
And deluge after deluge o'er her driven,
Has swept organic life from off her face.⁽¹⁾
Bird of a former world, would that thy form
Might reappear in these thy ancient haunts.
Oh for a sorceress nigh, to call thee up
From thy deep sandstone grave as erst of old
She broke the prophet's slumbers. But her arts
She does not practice in this age of light.

Enter Sorceress.

"Let the light of science shine,
I will show that power is mine
Sceptic, cease my art to mock
When the dead start out of rock.
Bird of mighty foot (Oh vain)
Ornithichnites called by name;
Science thus her ignorance shows,
On a footmark to impose
Name uncouth; while by my arts
Into life the biped starts.
Bird of sandstone era, wake!
From thy deep dark prison break.

1. This poem proceeds on the supposition now so extensively adopted by geologists that all the organic remains found in the secondary rocks belong to animals and plants that lived and died in the long interval that might have intervened between the beginning as described in Genesis and the creation of man. During this interval it would seem that several distinct races of organized beings were successively created and destroyed, each race being adapted to the state and climate better than other conditions of the globe.

Spread thy wings upon our air,
Show thy huge strong talons here:
Let them print the muddy shore
As they did in days of yore.
Pre-adamic bird, whose sway
Ruled creation in thy day,
Come obedient to my word,
Stand before Creation's Lord."
The sorceress vanished, but the earth around,
As when an earthquake swells her bosom, rocked.
And stifled groans with sounds ne'er heard before
Broke on the startled ear. The placid stream
Began to heave and dash billows on the shore;
Till soon, as when *Balaena*⁽²⁾ spouts the deep,
The waters suddenly leaped towards the sky,
And up flew swiftly, what a sawyer⁽³⁾ seemed,
But proved a bird's neck, with a frightful beak.
A huge shaped body followed, stilted high,
As if two main masts propped it up. The bird
Of sandstone fame was truly come again,
And shaking his enormous plumes and wings,
And rolling his broad eye around amazed,
He gave a yell so loud and savage too,
Though to *Iguanodons* and kindred tribes⁽⁴⁾
Music it might have seemed, on human ear
It grated harshly, like the quivering roar
That rushes wildly through the mountain gorge,
When storms beat heavy on its brow. Anon,
On wings like mainsails flapping on the air,
The feathered giant sought the shore where stood,
Confounded, he who called the sorceress' aid.
Awhile surveying all the monster paused,
The mountain, valley, plain, the woods, the fields,
The quiet stream, the village on its banks,
Each beast and bird. Next the geologist
Was scanned, and scanned again with piercing glance.
Then arching up his neck, as if in scorn,
His bitter taunting plaint he thus began.

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2. The whale, the largest of known animals, sometimes weighing 50 tons.

3. A *sawyer* is a tree which being undermined by a current of water falling into the stream lies with its branches above water which are continually raised and depressed by the force of the current. (Webster.)

4. The *Iguanodon* is an enormous herbivorous reptile, between 60 and 70 feet long, discovered in England in the rocks but no longer alive. It was more than twice as long as the longest crocodile. Another kindred animal was the *Megalosaurus*, 70 feet in length. Several others extinct might be named.

"Creation's Lord! the magic of these words
 My iron slumbers broke, for in my day
 I stood acknowledged as creation's head,⁽⁵⁾
 In stature and in mind surpassing all.
 But now, O, strange degeneracy! one,
 Scarce six feet high, is styled creation's lord!
 If such the Lord, what must the servants be!
 Oh how unlike *Iguanodon* next me
 In dignity, yet moving at my nod.
 Then *Mega-Plesi-Hylae*-⁽⁶⁾ Saurian tribes—
 Ranked next along the grand descending scale:
Testudo⁽⁷⁾ next below the *Nautilus*
 The curious *Ammonite* and kindred forms,⁽⁸⁾
 All giants to the puny races here,
 Scarce seen except by Ichthyosaurian eye,⁽⁹⁾
 Gone too the noble palms, the lofty ferns,
 The *Calamite*, *Stigmara*, *Voltzia* all:⁽¹⁰⁾
 And Oh! what dwarfs, unworthy of a name,
Iguanodon could scarce find here a meal!
 Grow on their graves! Here, too, where ocean rolled,
 Where coral groves the bright green waters graced,⁽¹¹⁾
 Which glorious monsters made their frolic haunts,

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5. Before the discovery of these *Ornithichnites* the most perfect animals that had been found as low in the rocks as the New Red Sandstone, were a few reptiles called *Saurians*, so that birds must have been decidedly the most perfect animals that then existed, though it has been recently announced in the journals that the tracks of quadrumanous animals have been found in the New Red Sandstone in Germany. But until I have seen the details of this discovery I am not disposed to let it spoil my poetry, for as to some quadrumanous animals I think that birds might successively compete with them the palm of superiority.

6. These are huge reptiles found fossil in England. They do not indeed occur as deep in the rocks as the New Red Sandstone, but since all belong to extinct races, the anachronism may be pardoned in poetry.

7. The tracks of the tortoise (*Testudo*) have been found in the New Red Sandstone.

8. The *Nautilus* and the *Ammonite* are curious chambered shells, found petrified chiefly.

9. The *Ichthyosaurus*, another extinct and huge saurian animal remarkable for the size of the eye, the orbit in some specimens measuring ten inches in length and seven inches in breadth.

10. The organic remains found in the rocks of the temperate and frigid zones correspond more nearly to those now found alive in the torrid zone than to those in the temperate and frigid zones. Indeed there can be no doubt but the northern hemisphere was once covered with tropical forests, such as the palms and ferns of huge size. The *Calamite*, *Stigmaria* (*Sigillaria*) and *Voltzia*, are names given to plants found in the New Red Sandstone which do not correspond to any now growing on the globe.

11. A sea fan (*Gorgonia Jacksonis*) not less than 20 feet high, is said to have been found in the rocks at West Springfield. No living *Gorgonia* even in tropical seas, is more than twelve feet high and this tribe of organized beings forms a large part of what are called "coral groves." Hence there is sufficient ground for representing the valley of the Connecticut as once covered by a tropical ocean, containing groves of coral. The enormous bird, that is described in the text, probably at least twice the size of the ostrich, is supposed to have frequented the shores of this ocean in search of food; and to have left its footmarks upon the mud, which was afterwards hardened into stone.

Where strange *Fucoides*, strewed its very bed,⁽¹²⁾
And fish of splendid forms and hues, ranged free,
A shallow brook troop, where only creatures live
Which in my day were Sauroscopic called,⁽¹³⁾
Scarce visible, now creeps along the waste.
And Oh! this chilling wind! a contrast sad
To those soft balmy airs, from fragrant groves,
That fanned the never varying summer once.
E'en he, whom I've heard called creation's lord,
(I call him rather Nature's blasted slave,)
Must smother in these structures dwellings called,
(Creation's noble palace was my home.)
Or these inclement skies would cut him off.
The Sun himself shines but with glimmering light,
And all proclaims the world well nigh worn out,
Her vital warmth departing and her tribes,
Organic, all degenerate, puny soon,
In nature's icy grave to sink forever.⁽¹⁴⁾
Sure 'tis a place for punishment designed,
And not the beauteous happy spot I loved.
These creatures here seem discontented, sad:
They hate each other and they hate the world,
I can not, will not live in such a spot.
I freeze, I starve, I die: with joy I sink,
To my sweet slumbers with the noble dead.
Strangely, and suddenly the monster sank,
Earth ope'd and closed her jaws, and all was still.
The vex'd geologist, calling aloud
Reached forth his hand to seize his sinking form;
But empty air alone he grasped, chagrined,
That he could solve no geologic doubts,
Nor have the history of sandstone days,
He passed out bitter words, 'gainst sorcery's arts,
Forgetting that the lesson thus taught pride,
Was better than new knowledge of lost worlds.

Amherst, March 1, 1836.

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12. *Fucoides* are fossil sea weeds, (?) resembling plants of the same tribe, (*Fucus*) now growing in the tropical seas.

13. Sauroscopic. That is, seen only by the eye of the *Ichthyosaurus*. "The shallow brook" is the Connecticut river. (!)

14. If it be admitted that the climate and vegetation and animals of this valley were tropical when this bird lived, who will say that its present condition would not seem, even to a rational being, in spite of circumstances to be one of deterioration, and approaching ruin?

I will now relate an Indian tradition respecting the former existence of an enormous bird on this continent. No part of the United States, not even the highlands of the Hudson, can vie in wild and romantic scenery with the bluffs of Illinois. On one side of the river, often at the water's edge, a perpendicular wall of rock rises to the height of some hundred feet. Generally on the opposite shore is a level bottom, or prairie several miles in width extending to a similar bluff that runs parallel with the river. One of these ranges commences at Alton and extends with few intervals for many miles along the left bank of the Illinois. In descending the river to Alton, the traveller will observe between that town and the mouth of the Illinois, a narrow ravine through which a small stream discharges its waters into the Mississippi. That stream is the Piasa. Its name is Indian, and signifies in the language of the Illini, *the bird that devours men*. Near the mouth of that stream on the smooth and perpendicular face of the bluff, at an elevation which no human art can reach, is cut the figure of an enormous bird with its wings extended. The bird which this figure represents was called the Piasa by the Indians, and from this is derived the name of the stream.

The tradition of the Piasa is still current among all the tribes of the upper Mississippi, and those who have inhabited the valley of the Illinois, and is briefly this: many thousand moons ago, before the arrival of the pale-faces, when the great *Megalonyx* and *Mastodon* whose bones are now dug up were still living in the land of the green prairies, there existed a bird of such dimensions that he could easily carry off in his talons a full grown deer. Having obtained a taste of human flesh, from that time on he would prey upon nothing else. He was artful as he was powerful, and would dart suddenly and unexpectedly upon an Indian, bearing him off into one of the caves, and there devour him. Hundreds of warriors attempted for years to destroy him but without success. Whole villages were nearly depopulated, and consternation spread through all the tribes of the Illini. At length Ouatoga, a chief whose fame as a warrior extended even be-

yond the Great Lakes, separating himself from his tribe fasted in solitude for a whole moon, and prayed to the Great Spirit the Master of Life that he would protect his children from the Piasa. On the last night of his fast the Great Spirit appeared to Ouatoga in a dream, and directed him to select twenty of his warriors, each armed with a bow and poisoned arrows, and conceal them in a designated spot. Near the place of their concealment, another warrior was to stand in open view as a victim of the Piasa which they must shoot the instant that he pounced upon his prey. When the chief awoke in the morning he thanked the Great Spirit and returning to his tribe told them his dream. The warriors were quickly selected and placed in ambush. Ouatoga offered himself as the victim. He was willing to die for his tribe. Placing himself in open view of the bluff, he soon saw the Piasa perched on the cliff eyeing his prey. Ouatoga drew up his manly form, and planting his feet firmly on the earth began to chant the death song of the warrior. A moment later the Piasa rose into the air and swift as the thunder bolt darted down upon the chief. Scarcely had he reached the victim when every bow was sprung and every arrow sent to feather in his body. The Piasa uttered a wild fearful scream and expired. Ouatoga was safe. Not an arrow, nor even the talons of the bird had reached him. The Master of Life in admiration of his generous deed had held over him an invisible shield. In memory of this event the image of the Piasa was engraven on the face of the bluff. Such is the Indian tradition.

Among the deductions deriving from the study of these foot marks we may derive an important moral lesson. To leave our names inscribed on the world's history is a universal desire of mankind. To be distinguished, men have sacrificed comfort, health, life, and even moral principle, and yet have been unable to crawl into the remotest corner of history. Not a track remains nor a single hoof, of all the countless multitude of men and beasts whose warlike progress in ancient times has spread desolation over the earth. But the reptiles and worms that crawled upon the half-finished

surface of our planet, have left memorials of their passage enduring and indelible.

Take a case often observed among these footmarks. We sometimes notice a change in the direction of the animal as it moved along, and of course an impression on the rock deeper or more shallow than usual, of portions of the foot, by the action of the muscles employed in changing the animal's course. Here then we have a register of so slight an action as the turning of an animal's line of march. Nay more! The movement of the muscle implies an act of will (and that will acted by a nerve current first inward along the sensor nerves and then outward through the motor nerves.) Let human ambition then learn a lesson of humility as it sees the register of the act of an animal's will, itself finding its mightiest efforts unable to save it from early oblivion, while these senseless brutes carry off the palm of immortality.

But he who performs noble actions need not despair. These brutes had only dead matter to work upon. We have living mind to influence—indestructible immortal mind; then let us act nobly and thus

"departing leave behind us
footprints on the sands of time."

II.—THE DARTMOUTH COLLEGE ICHNOLOGICAL COLLECTION.

The specimens illustrating the footmarks of the Triassic period in the Connecticut Valley consist of slabs brought to Dartmouth by Professor C. H. Hitchcock in the early days; slabs purchased from T. M. Staughton by the College in 1906 and installed in the Butterfield Museum at Dartmouth in 1908, slabs resulting from fresh excavations at Turners Falls, Massachusetts, by C. H. Hitchcock in the summer of 1906. A very few slabs also were dug up on the outskirts of Granby, Massachusetts, at the same time. To these have been added still earlier collections—one from the Carboni-

ferous of Kansas brought with the Butterfield specimens and another from rocks of the same age in Nova Scotia collected by Professor Hitchcock about 1894. The slabs are now installed in cases on the second floor of the Butterfield Museum, and fastened upon the walls or displayed upon tables in room 302 of that building. The rock making up the slabs has an estimated weight of 140 lbs. to the cubic foot. Where dimensions of the slabs are given they are in the order of length, breadth, and thickness.

The combinations of various fossil remains found on certain of the slabs prevents any convenient systematic listing of them according to the type of impressions upon them, so they are now given in the order in which Professor Hitchcock numbered them, without regard to the position of the contained fossils in the animal or plant kingdom. Footnotes indicate the present accepted classification of the life represented. Professor Hitchcock used the nomenclature of his father's publication of 1848 (*loc. cit.*) in his notes, but I have revised his data following that given by Lull, (6). Wherever comments are made upon any of the slabs they are those of Professor Hitchcock exclusively, but at times they have been slightly modified to make them clearer to the reader. Where no remarks are found, it must be assumed that Professor Hitchcock did not find time to closely examine the particular specimen, but thought it worthy of preservation for further study. The Dartmouth College Ichnological Collection is available for the use of those who may be interested in this branch of paleontological science. Specimens which are not starred may be exchanged for other museum material offered by institutions, or otherwise disposed of at the discretion of the Chairman of the Department of Geology and Geography.

* No. 1. Impression of rain drops from the Lily Pond in the vicinity of the mouth of Miller's river, a tributary of the Connecticut. Size of slab 3 ft. 7 in. by 1 ft. 2 in. by 1 inch.

* Not available for purchase or exchange.

6. Lull, R. S. Triassic Life of the Connecticut Valley. State of Connecticut Geological and Natural History Survey, Bull. No. 24, 1915.

No. 2. Showing two tracks in succession resembling those of the old *Brontozoum expansum*† of E. Hitchcock, 1848, (*Anchisauripus expansus* after Lull). The length of the step is greater, (29 in.), than the normal (25 in.) but there is agreement in other respects. Also two odd impressions perhaps of *Grallator cuneatus*⁽¹⁾ E. Hitchcock and mud cracks. Size of slab 3 ft. 3 in. by 1 ft. 6 in. by 1½ in.

No. 3. *Anchisauripus sillimani* (E. Hitchcock) and *Anchisauripus hitchcockii* Lull.⁽²⁾—(Footprints of *Anchisaurus* sp.) Size of slab 3 ft. 7 in. by 2 ft. 8 in. by ¾ in.

No. 4 Exhibiting abundant plant remains and quadrupedal tracks suggesting *Batrachopus gracilis* (E. Hitchcock).⁽³⁾ The tracks of *Grallator* sp. are present in relief. Lily Pond. Size of slab 4 ft. 7½ in. by 3 ft. 2½ in. by 1¼ in.

*5. The tracks of *Anchisauripus sillimani* (E. Hitchcock),⁽²⁾ *Anchisauripus hitchcockii* Lull and *Grallator cuneatus* E. Hitchcock,⁽¹⁾ Lily Pond. Size of slab 3 ft. 6 in. by 3 ft. 5½ in. by 1 in.

*6. Exhibiting two large trifold impressions, with a distance of 34 inches between them. These apparently represent an aberrant form suggestive of "*Anchisauripus expansus*" or *Anticheiropus hamatus*⁽⁴⁾ E. Hitchcock. Thought by Professor Hitchcock to be an undescribed animal "which had a large terminus for the body of the foot," but a poor development of the toes. There are also a multitude of small quadrupedal tracks. Lily Pond. Size of slab 6 ft. by 3 ft. 8 in. by 3¼ in.

*7. Exhibiting many tracks of *Anchisauripus hitchcockii* Lull., *Anchisauripus sillimani* (E. Hitchcock), and some small

† This name was abandoned after the publication of the Fossil Footmarks of 1848. Hay (Bull. U. S. Geological Survey 179: 543) states that "the materials on which this species was based have evidently been assigned to some other species; which one cannot be determined."

(1) A Theropod Dinosaur, family Grallatoridae.

(2) A Theropod Dinosaur, family Anchisauripodidae.

(3) A Parasuchian reptile, family Batrachopodidae.

(4) An ichnite, *incertae sedis*.

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3-4 toed animal. A large track of *Eubrontes*⁽⁵⁾ or *Anchisauripus* is in the lower corner. Lily Pond. Size of slab 5 ft. 6 in. by 5 ft. 10 in. by 1 in.

*8. Displaying one fine track of *Anomoepus giganteus*⁽⁶⁾ C. H. Hitchcock sp. nov. from Granby crossing or Aldrich's Mills, Mass. The specimen has the distinctive *Anomoepus* heel. A lower track is very dim and is not certainly made out. There is some resemblance to *Amblonyx*⁽⁶⁾ (*Sauropus*) or *Aethyopus* (*Sauropus*) but this is not a final conclusion. Size of slab 6 ft. 5 in. by 3 ft. 2 in. by 1 in.

9. Various undetermined footprints from the Lily Pond region. Size of slab 4 ft. by 2 ft. 6½ in. by 2½ in.

*10. Presenting tracks of *Grallator cuneatus* E. Hitchcock?⁽¹⁾ *Anchisauripus tuberosus* (E. Hitchcock)?⁽²⁾ From Granby, Mass. Size of slab 5 ft. 10 in. by 3 ft. 6 in. by 1 in.

*11. Has a row of five tracks of *Eubrontes divaricatus* (E. Hitchcock)⁽⁵⁾ and one of *Eubrontes giganteus* E. Hitchcock.⁽⁵⁾ Lily Pond. Size of slab 13 ft. 6 in. by 2 ft. 7 in. by 2½ in.

12. Track of *Eubrontes divaricatus*⁽⁵⁾ (E. Hitchcock). Size of slab 9 ft. 7½ in. by 5 ft. by 3½ in.

*13. Indicating ripple marks. Collected at Horse Race on Connecticut River, near Miller's Corner, Mass. Size of slab 5 ft. by 4½ in. by 1½ in.

*14. Along middle row six tracks of "*Anchisauripus expansus*" good enough to be typical specimen for this proposed species."† On one side a row of four tracks of *Anchisauripus sillimanni* (E. Hitchcock)⁽²⁾ and an odd one near another side. Opposite the first named are the best known tracks of *Anomoepus gracillimus* (E. Hitchcock)⁽⁶⁾ with as many as 14 imprints of the pes and 5 of the manus. There was originally another of each of the feet in a triangular hole filled with cement. It was cut out by one of the Amherst College students when visiting the quarry with Professor B. K. Emerson. Size of slab 11 ft. 6½ in. by 3 ft. 1½ in. by 3 in.

*15. Exhibiting the track of an annelid from one corner

(5) A Theropod Dinosaur, family Eubrontidae.

(6) An Orthopod Dinosaur, family Anomoepodidae.

diagonally across to a lower one. This is suggestive of *Acanthichnus tardigradus* E. Hitchcock, (*Pterichnus centipes* E. Hitchcock).⁽⁷⁾ One section includes many plant impressions, including piece of bark with leaf scars. There is also a track like the rounds of ladder without the sides. *Anchisauripus sillimani* (E. Hitchcock)⁽²⁾ is represented by a "beautiful" track near the middle of slab. Size of slab 7 ft. 5½ in. by 3 ft. by 2 in.

16. Showing various**Grallator* imprints.⁽¹⁾ Size of slab 6 ft. 6 in. by 5 ft. by 2¼ in.

17. A row of the tracks of *Anchisauripus hitchcockii* Lull.⁽²⁾ nine in number, many of the impressions very distinct. "I was disposed to make this slab a type of the description not made out by Lull in his notice of the species. He gave only the reference to the Middletown slab at Amherst, 194, without measurements. There are other individual tracks of this animal upon this slab." Size of slab 12 ft. 4 in. by 3 ft. by ⅝ in.

*18. "More tracks of *Eubrontes giganteus*⁽⁵⁾ E. Hitchcock, and what is remarkable, these seem to be impressions of two other feet just in front. Can it have been a quadruped? There is a slab like it at Amherst but no thought there of its being quadrupedal." From the Lily Pond. Size of slab 11 ft. 5 in. by 1 ft. 8 in. by 1½ in.

19. Five tracks in relief of a *Grallator*⁽¹⁾—a sixth imprint having been obscured by a triangular area 3 ft. long of elevated roundish and elongated spots suggestive of *Batrachoides nidificans* E. Hitchcock⁽⁴⁾ "The surface is not the one actually deposited upon the floor. It walked upon a layer about ⅛ in. in thickness which has been peeled from it, but this layer has been preserved in No. 20, and in slabs sent to the Carnegie Museum in Pittsburgh, and to Amherst. I believe the *Batrachoides* part of the depressed surface was sent to Amherst and there are several small pieces of related character in the Butterfield Museum at Dartmouth. No well defined *Batrachoides* was found at Lily Pond. I proposed the

(7) The trail of an Arthropod, *incertae sedis*.

new generic name *Koilosoma* for *Batrachoides*. (The latter name is pre-occupied by Lacépède for a genus of fishes.)

*20. Displaying the tracks of what is probably a new species of Dinosaur. The foot is 6 in. in length, and there is very little variation in the length of step of 24 in. It comes in some respects near to *Grallator cuneatus* E. Hitchcock,⁽¹⁾ but the length of step of the latter (22-24 in.), and its foot (4.9-5 in.) is smaller. The distance between the tips of the lateral toes is 3.25 inches in this species, and but 2.9 in *cuneatus*. The apparently new form lacks the cuneate heel. Possibly it is "*Grallator rectus*." A thumb seems to be present upon one of the slabs. I got it in 1906 at Lily Pond. Having dug down some 15 feet without very good success I came to a layer well covered with plant impressions—and a row of tracks of this animal, 17 in number in a straight line. There are several individual specimens of this in the Dartmouth Collection. Size of slab 5 ft. 3 in. by 5 ft. 1½ in. by 1½ in.

21. Exhibiting red sandstone with tracks in relief from the Dickinson Quarry in South Hadley, Mass. The counterpart to this is in the Museum of Mt. Holyoke College. "Interest is attached to these tracks on account of their resemblance to *Grallator cuneatus* E. Hitchcock⁽¹⁾ only the length of the step is not great enough. There are two tracks side by side as if the animal stood still for a time—as otherwise one track would have been in advance of the other. But there is a tailmark—indicating an animal more of the *Anomoepus*⁽⁶⁾ kind which carry tails while the *Grallator*⁽¹⁾ has never been known to possess one. I thought at first this specimen belonged to a *Grallator* and as such proved the presence of a tail." The creature now seems to me to be allied to the *Anchisaauripus hitchcockii*⁽²⁾ Lull, but there is room for further study." Two or more tracks of *Grallator gracilis* C. H.⁽¹⁾ Hitchcock are on this slab. This locality is remarkable for the many kinds of *Anomoepus* found—all the specimens of which are preserved in the Mt. Holyoke College Museum except this one and another in the Dartmouth College Collection. It is difficult to obtain more specimens

except at great cost for excavation—since the quarry is on a hill nearly a mile north of the College. Size of slab 3 ft. 3 in. by 1 ft. 6 in. by 2 in.

22. A slab whose track at one corner is remarkable for the great bend inwards of the middle toe. Impressions of insects and minute trails of various sorts are present. Size of slab 4 ft. 1 in. by 2 ft. 1 in.

*23. Exhibiting plant remains resembling palm leaves. Comparison is suggested with the lower side of No. 18. Size of slab 3 ft. by 2 ft. 10 in. by $1\frac{1}{4}$ in.

*24. A slab showing four tracks of a small quadruped, *Batrachopus*.⁽³⁾ Length of step 8 in. Nothing like it has been described. To be compared with No. 6. The trails of insects and other animals are present, as well as impressions of plants. Also a trail resembling that of *Copeza* sp.⁽¹⁰⁾ Plants. "Apparently obtained from near No. 22." Size of slab 3 ft. 3 in. by 6 in. by $1\frac{1}{4}$ in.

*25. Displaying several impressions near together of a form resembling *Anomoepus*,⁽⁶⁾ or *Plesiornis*,⁽⁸⁾ and *Anchisauripus sillimani* (E. Hitchcock).⁽²⁾ Size of slab 2 ft. by 1 ft. 9 in. by $1\frac{1}{4}$ in.

26. Footprints of "*Anchisauripus expansus*"† Size of slab 4 ft. by 1 ft. 6 in. by $1\frac{1}{2}$ in.

27. Footprints of *Anomoepus*⁽⁶⁾ Size of slab 2 ft. 6 in. by 1 ft. 10 in. by 1 in.

28. Three tracks of *Grallator gracillis*⁽¹⁾ C. H. Hitchcock with rather long step. Surface also shows plant impressions and insect tracks. Two tracks of *Grallator gracilis* also near one side. Size of slab 4 ft. $3\frac{1}{2}$ in. by 2 ft. $6\frac{1}{2}$ in. by $1\frac{1}{4}$ in.

*29. Fossilized impressions of rain drops. Size of slab 3 ft. by 1 ft. 11 in. by 1 in.

30. A slab showing a large track with a step of 2 ft. 8 in. Also a small *Grallator*, with a step of 18 in. Surface resembling the impressions of palm leaves and many small particles suggestive of scattered seed. Size of slab 4 ft. by 2 ft. 6 in. by $\frac{3}{4}$ in.

(8) ? Reptilia.

31. A slab remarkable for the distinctness of the phalangeal impressions of a fossil animal as yet undetermined.

*32. A single track of *Anchisauripus minusculus*⁽²⁾ E. Hitchcock. Size of slab 2 ft. 6 in. by 1 ft. 6 in. by $1\frac{3}{8}$ in.

33. Various undetermined footprints. Size of slab 3 ft. $5\frac{1}{2}$ in. by 2 ft. 6 in. by 1 in.

34. Footprint of a fossil animal, with a step of 2 ft. 4 in. Size of slab 3 ft. by 1 ft. 6 in. by $\frac{1}{2}$ in.

35. Various undetermined footprints. Size of slab 4 ft. 2 in. by 2 ft. by 1 in.

36. Footprint of a fossil animal, with a step of 1 ft. 9 in. Size of slab 2 ft. 6 in. by 1 ft. 6 in. by 1 in.

37. Various undetermined footprints. Size of slab 4 ft. 7 in. by 2 ft. by $\frac{3}{4}$ in.

38. Various undetermined footprints. Size of slab 4 ft. $4\frac{1}{2}$ in. by 2 ft. 6 in. by $1\frac{1}{2}$ in.

39. Footprint of "*Anchisauripus expansus*."† Length of step 2 ft. 6 in. Size of slab 6 ft. 5 in. by 2 ft. by 1 in.

40. Various undetermined footprints. Size of slab 5 ft. 9 in. by 2 ft. 6 in. by $2\frac{1}{4}$ in.

*41. Footprint of *Eubrontes approximatus* (C. H. Hitchcock)⁽⁵⁾.

42. Showing 5 rows of tracks made by *Anchisauripus sillimani* E. Hitchcock.⁽²⁾

43. Showing two *Anchisauripus* tracks in relief. Presented by Elliott Bradley. These are all called "*Brontozoum Sillimanium*" in E. Hitchcock's report but are referred to *Anchisauripus sillimanii* (E. Hitchcock)⁽²⁾ and *Anchisauripus hitchcockii* by R. S. Lull.⁽²⁾ The type being the Middlefield slab 9-14 at Amherst. Obtained at Portland, Connecticut.

*44. Presenting three large tracks, "below the proper surface," said by T. M. Staughton to have been made by *Otozoum Moodii* E. Hitchcock.⁽⁹⁾ Size of slab 8 ft. 6 in. by 2 ft. 6 in. by 2 in.

45. Various undetermined footprints. Size of slab 10 ft. 3 in. by 5 ft. 1 in. by 2 in.

46. Showing a number of fossil footprints. "One of the

(9) An Orthopod Dinosaur, family Otozoidae.

odd tracks is that of a creature whose foot was like one's knuckle impressed into mud. Owing to infelicitous circumstances I failed to get the succession—and am not able to properly describe the track. It may be the same thing on Nos. 37, 38, 40, where the length of step can be determined."

*47. A footprint of *Anticheiropus pilulatus*⁽⁴⁾ E. Hitchcock—the largest of all the tracks. "From Elijah Marsh's quarry in S. W. Montague—the locality whence the slabs were taken to Greenfield in 1835 where they attracted the comment of Mr. Draper—(See No. 70.) From this quarry my father, (Edward Hitchcock), obtained an impression and its cast in the early days but did not venture to name it until 1864 when he found a similar track of small size. This specimen I found at the same quarry in 1906 and though unsatisfactory it substantiates the existence of the earlier track. The Dartmouth specimen may be a fragment originally associated with certain specimens now at Amherst. The value of this track lies in its corroboration of the presence of a huge batrachian in the Trias. The relatives of that creature as known by their bones are all of small size like *Cheirotherium*, *Eryops*, *Mastodonosaurus* and the American Museum of New York people think there were none larger. *Otozoum*⁽⁹⁾ for such reason is ruled out of Batrachian family though clearly allied to *Cheirotherium*; *Anticheiropus* is clearly allied to some of the Carboniferous amphibian tracks—and I say therefore *Anticheiropus* and *Otozoum* were amphibians as advocated for *Otozoum* by my father. This specimen is more symmetrical than the one at Amherst."

48. An undetermined impression.

*49. Footprints of *Platypterna deanii* E. Hitchcock⁽⁸⁾—"Abandoned by my father in the supplement without giving reasons—but this animal fits the old description fairly well."

50. Footprint of *Eubrontes giganteus* E. Hitchcock.⁽⁵⁾

51. A fossil footprint resembling No. 31.

52. Footprints of *Anomoepus*⁽⁶⁾ and *Grallator*⁽¹⁾ in relief, associated with large ripple marks and fossilized wood. Size of slab 3 ft. 9½ in. by 2 ft. by 2¾ in.

*53. Various undetermined footprints. Size of slab 8 ft. 3 in. by 4 ft. 11½ in. by 2¾ in.

54. Exhibiting the bark of a tree near one corner—and just under the figure 54 a track of *Copeza* (*Lithographus*) sp.⁽¹⁰⁾ “perhaps the one described elsewhere of an animal jumping about as if intoxicated.” Size of slab 3 ft. by 1 ft. 6¾ in. by ¾ in.

*55. Tracks in relief of the old *Anchisauripus exsertus*⁽²⁾ E. Hitchcock and *tuberosus* (E. Hitchcock)⁽²⁾ from Connecticut river bank below Smith’s Ferry, Mass. Size of slab 2 ft. 6 in. by 1 ft. 6½ in. by 1 in.

56. Various undetermined footprints. Size of slab 4 ft. 8 in. by 3 ft. 4½ in. by 2 in.

57. Showing large ripple marks and smaller ones made across the first by a change in the currents before the mud became too hard to be impressed. This illustrates the belief of Professor Hitchcock that *Batrachoides* (*Koilosoma*) *nidificans* E. Hitchcock⁽⁴⁾ is not to be explained as made by cross ripple marks. “I found large surfaces of this sort in '06 and sent a slab like this one to Amherst.” Size of slab 2 ft. 6 in. by 1 ft. 6 in. by 1¾ in.

58. *Eubrontes divaricatus* (E. Hitchcock)?⁽⁵⁾

59. This number is missing from the collection.

60* and 61. Impressions representing *Mormolucoides articulatus* E. Hitchcock.⁽¹¹⁾ From about the upper part of the Horse Race, Gill, Massachusetts.

62. Illustrating the so called “frost marks” of Dr. Joseph Barratt, but according to E. Hitchcock produced through the agency of water or annelids. From Turners Falls, Massachusetts.

*63-64. Impressions of “*Clathropteris rectiusculus*.”⁽¹²⁾ From Easthampton, Massachusetts.

65-67. Footprints of Carboniferous Amphibia from Jog-gins, N. S.

68. A coprolite from the Lily Pond region.

(10) An insect track.

(11) Trail of a Neuropterid insect.

(12) One of the Filicales (Ferns).

69. Footprints of *Eubrontes approximatus* (C. H. Hitchcock).⁽⁵⁾ From below Smith's Ferry, Northampton, Mass.

*70. *Steropoides diversus* (E. Hitchcock).⁽¹³⁾ One of the first tracks sent by W. W. Draper to Dexter Marsh in 1835 (see lecture on Ichnology). Collected from the quarry at S. W. Montague, Massachusetts.

71. Another track of *Steropoides diversus* (E. Hitchcock).⁽¹³⁾ From Gill below Turners Falls, Mass.

72. A portion of the track of *Otozoum Moodii* E. Hitchcock,⁽⁹⁾ from South Hadley, Mass.

73-75. Footprints of Carboniferous Amphibia. Joggins, N. S.

76. Showing specimens of the imprints of *Lithographus hieroplyphicus* E. Hitchcock⁽¹⁰⁾ and *Eubrontes*, sp.⁽⁵⁾ From the Lily Pond region.

*77. Impressions of *Grammepus* sp.⁽⁷⁾ and *Acanthichnus cursorius*.⁽¹⁰⁾ E. Hitchcock.

78-79. Fossilized remains of various insects and worms.

80*-81. Small trifold tracks from the Gill side of the Connecticut River at Turners Falls. 81. (?) consists of "three tracks much like *Stenonyx lateralis* (E. Hitchcock).⁽⁵⁾ If so, data are afforded for further description of the species not to be found elsewhere.

*82. Footprint of *Batrachopus gracilior* (E. Hitchcock) (*Anisopus*, E. Hitchcock).⁽⁴⁾

83. An undetermined impression.

84. Impression resembling the bark of a conifer.

*85. Footprints suggestive of *Orthodactylus floriferus*, E. Hitchcock⁽¹⁴⁾ and *Anchisauripus* sp.

86-87.* Impression representing *Halysichnus tardigradus* E. Hitchcock.⁽¹⁵⁾ Brought from Lily Pond region in 1906.

88. Footprints of *Sillimanianus gracilior* E. Hitchcock.⁽¹³⁾

*89. An impression representing *Lithographus heiroglyphicus* E. Hitchcock.⁽¹⁰⁾

(13) A Track of a bi-pedal reptile?

(14) Amphibian footprint?

(15) A worm trail.

90. A worm-like preservation resembling certain others at Amherst.

91. Tracks of *Acanthichnus* sp.⁽¹⁰⁾

92. A new track of *Grallator*.⁽¹¹⁾ From Turners Falls, Massachusetts.

93. Same as 90.

94. Tracks of an insect.

95. Embodying tracks suggestive of 90 and 93.

96. A quadrupedal impression of some unknown animal.

*97. Footprints of *Palamopus gracilipes*. (E. Hitchcock).⁽¹⁴⁾ The one figured in Ichnology (Pl. 34)* lacks the distinct heel possessed by this specimen.

98. An unidentified fossil impression from Wethersfield, Connecticut.

99. A preservation resembling the veins of a leaf.

*100. A rather large foot print of *Exocampe ornata* E. Hitchcock.⁽¹⁴⁾

*101. Footprints of *Triaenopus Baileyi*. (E. Hitchcock).⁽¹⁰⁾ From Wethersfield, Connecticut.

102. A fossil impression of unknown affinity from the north bank of Turners Falls.

*103. Tracks of *Acanthichnus cursorius* E. Hitchcock⁽¹⁰⁾ and *A. trilinearis* E. Hitchcock⁽¹⁰⁾ Lily Pond.

104. Insect tracks from Wethersfield, Connecticut.

105. An undetermined quadrupedal impression.

106. An undetermined track of a fossil animal.

*107. *Tarsodactylus expansus* C. H. Hitchcock.⁽¹⁶⁾ This is the type specimen of this rare footprint. Collected near Greenfield, Mass. The only recorded locality.

108. Same as 88. E. Hitchcock.

109. Footprint of a *Grallator*.⁽¹⁾

*110. An obscure track of *Acanthichnus punctatus* E. Hitchcock.⁽¹⁰⁾

111. This is apparently missing from the collection.

112. Professor Hitchcock notes this to be a "New species and genus of the intoxicated bug." See No. 54.

* Hitchcock, E. 1858, *loc. cit.*

(16) Quadrupedal reptile?

113. Insect tracks of various sorts.

*114. Tracks of *Lithographus heiroglyphicus* E. Hitchcock.⁽¹⁰⁾

*115. Footprints of *Argoides minimus* E. Hitchcock.⁽¹³⁾

116. Footprint of *Batrachopus gracilior*. (E. Hitchcock).⁽³⁾ Compare with 82.

117. Footprint of *Palamopus gracilipes* (E. Hitchcock).⁽¹⁴⁾

118. Impressions of Raindrops.

*119. A very large footprint of *Anomoepus minimus* E. Hitchcock.⁽⁶⁾

*120. Track of *Koilosoma nidificans* E. Hitchcock.⁽¹⁴⁾ From the typical locality at South Hadley, Massachusetts.

121. Showing plant remains resembling a palm leaf. From the Lily Pond region, 1906.

122. Other plant impressions from the Lily Pond region, 1906.

123-124. Plant impressions resembling *Dendrophycus*.⁽¹⁷⁾

125. An undetermined fossil impression from Wethersfield, Connecticut.

126. An undetermined impression.

127. Exhibiting two tracks in relief of *Grallator gracilis* C. H. Hitchcock.⁽¹⁾ This is the counterpart of slab 28.

*128. Tracks of fossil insects represented by *Conopsoidea larvalis* E. Hitchcock—"an unusual jump;"⁽¹⁰⁾ and *Acanthichnus cursorius*. E. Hitchcock.⁽¹⁰⁾

129. Missing.

130. *Anomoepus* sp.⁽⁶⁾ and *Grallator gracilis* C. H. Hitchcock⁽¹⁾—"Should be compared with slab 21." From the Dickinson Quarry, South Hadley, Massachusetts.

131. Plant remains collected from the Lily Pond region in 1906.

132-133. Irregular roundish impressions suggestive of *Koilosoma* sp. from the Lily Pond region, 1906.

134. Showing impressions of fish remains on the old Triassic beach mud.

(17) An algal like impression.

- *135. Fossil ripples.
- *136. Footprint of *Argoides macrodactylus* (E. Hitchcock)⁽¹³⁾ from Chicopee, Massachusetts.
- 137. An undetermined impression.
- 138. Footprint of *Anchisauripus sillimani* E. Hitchcock.⁽²⁾
- *139. A large slab illustrating *Unisulcus (Herpystezoum)* sp. (E. Hitchcock).⁽¹⁵⁾
- 140. Undetermined plant remains.
- 141. Footprints of a *Grallator*.⁽¹⁾
- 142. Undetermined plant remains.
- 143. Footprint of *Anchisauripus sillimani* (E. Hitchcock)⁽²⁾ showing the hallux. The other tracks on this slab have not been fully studied. This was the best specimen obtained at the Lily Pond in 1906.
- 144. Plant impressions from the Lily Pond regions, 1906.
- 145. A footprint of *Plesiornis*⁽¹⁸⁾ obtained from Wethersfield, Connecticut.
- 146. An undetermined impression.
- 147. A footprint of *Anomoepus* sp.⁽⁶⁾
- 148. Impressions of Raindrops.
- 149. A footprint of *Anchisauripus* sp.⁽²⁾ obtained from the Lily Pond region in 1906.

(18) Vertebrata, *incertae sedis*.

* There are also in the Dartmouth Collection excellent specimens of *Climacichnites wilsonii*, from the Potsdam sandstone (Upper Cambrian) of New York, collected by Professor William Patten from Bidwell's Crossing, Sciota, N. Y., and of *Dactyloidites Asteroides* from the Georgia slate of Swanton, Utah.

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BOTANICAL GLEANINGS IN MICHIGAN—IV.

OLIVER A. FARWELL.

The botanical season opened up in Michigan about three weeks later in 1926 than it did in 1925 and somewhat later than in 1924. The first trip of the season was made May 5, to Britton, Lenawee Co., this being also the first visit to this county. The only woodland flowers seen were the Spring Beauty, Yellow Adder's Tongue, and Purple Cress, amongst the herbs, and the Box Elder, Spice Bush, and Prickly Ash amongst the woody plants. The Poplar and the Red Maple had passed the flowering stage and some of the willows were beginning to appear. Along the railway tracks, the Shepherd's Purse, Pennycress, Dandelion and Corn Gromwell were in bloom. At Newport, May 12, we explored an interesting piece of woods, the most interesting finds being the False Mermaid and the Harbinger-of-Spring, both of which covered acres of ground. Here, too, we found the Dwarf Ginseng, some plants of which had four leaves in the whorl.

After a two months seige of cystitis, botanizing was resumed July 14 in the vicinity of Ann Arbor. Getting back to the woods again was a very pleasant change. The Trumpet Flower was found as an escape; also *Berberis Thunbergii*. The former along the railway tracks and the latter in some oak woods. July 21 was the hottest day of the summer that we had thus far had, the mercury reaching 93° in the shade at 11:30 A. M. A pleasant breeze made the tramping more endurable than it otherwise would have been. On this day we were in Scio township and the outstanding discovery of the day was *Carex triceps* var. *hirsuta*. Vacation was spent in the Copper idstrict of Michigan where *Potentilla Pennsylvanica* was found and collected which perhaps is the first time it has been collected in Michigan.

At Copper Harbor, one of the finest harbors of refuge on Lake Superior, the waters of the harbor were seen to be very low, perhaps the water level was the lowest this year

in the memory of man. The harbor is protected from the ravages of the lake on the north by an island known as Porter's Island. The harbor is one half mile, more or less, across and over this distance from the mainland, the reef connecting Porter's Island with the mainland at Hunter's Point was seen to be above the surface of the water. It appeared to be at least four inches above water level which probably means six inches or more. My maternal grandfather, the late Mr. D. D. Brockway, went to Copper Harbor with his family in 1846 and built the first house there. His family was the first white family in the Copper District and his daughter, now Mrs. Sallie L. Scott, born at L'Anse, in 1844, was the first white child born in the mining districts of Michigan. I have heard him make the statement that when he first went to Copper Harbor, he could walk from Hunter's Point to Porter's Island without getting his feet wet, which means that the water level in the late forties, especially 1847, was within 3 to 6 inches of being as low as it is now, (about 600 ft. 10 in., August 5, 1926), or possibly even as low as now. Porter's Island at the present time is not an island at all but a peninsula.

I have given considerable time to observations this summer, of *Corallorhiza maculata* and I find that all the parts ultimately turn brown; that the spotting of the perianth is variable and unreliable; that these color variations should be regarded as *forms* and not as *varieties*; that it is impossible to detect one from another after they have been dried and have become herbarium specimens except in the case of the var. *flavida* with a spotless lip; all forms with spotted lips are indistinguishable when dried. My observations show that at the beginning of flowering the sheaths are much the same color as the scapes or a little paler. When capsules are mature, the perianth and sheaths are brown. I collected at the same time late flowering specimens of var. *flavida* with yellow sheaths and mature fruiting specimens of the same with sheaths and withered perianth Van Dyke Brown; they had been growing side by side. Near by were the *typical form* of the species and the var. *intermedia* in all stages, at least

the sheaths and perianths were, from their normal colors to brown, depending upon the age or stage of growth. I have found var. *flavida* this summer with a spotted lip and I know that the plants Alexander reported from Birmingham as of this *variety* likewise had spotted lips. In *Rhodora* XXVII, 11-14, Mr. H. H. Bartlett is disinclined to accept his var. *fusca* as synonymous with var. *intermedia* and states that his var. with stem "light cinnamon drab" would hardly be described by any one as "exactly intermediate" between var. *flavida* (lemon-yellow) and the type (perilla purple.) If lemon yellow paint is mixed with an equal part of perilla purple paint, the "exactly intermediate" color thus produced will be "light cinnamon drab." The coloration then of the stems in each case is the same, the spotting of the perianth is variable and unreliable, and the brown of the sheaths is due to age: there seems to be no distinctions between vars. *intermedia* and *fusca* except change of color due to age.

Observations on the pods (generally miscalled "berries" which they are not any more than pea pods are) and pedicels of *Actaea* species as found in Michigan reveal that the pedicels of *A. rubra* may be red or green at the maturity of the pods which contain about 12 seeds; the pods are red (passing through crimson to carmine) or white. In *A. alba*, the specimens collected with green pedicels were immature and in all likelihood they would have been red if they had been allowed to grow to maturity; flowering and fruiting much later than *A. rubra*; pods smaller, 6 to 10 seeded. In *A. rubra* there may be as many as 40 pods to the ovoid or oval raceme; the most noted for *A. alba* was 28 on the long, linear-oblong raceme and the fewest noted was 5 on the short, oblong raceme. In *A. rubra* the pedicels are slender, about $\frac{1}{4}$ line thick and from 3 to 11 long but in f. *neglecta* the pedicels may be $\frac{1}{2}$ line thick; in *A. alba*, the pedicels usually are $\frac{3}{4}$ to $1\frac{3}{4}$ lines thick and range from 3 to 9 in length.

Unisema or *Pontederia* for our Pickerelweed. In *Rhodora*, Vol. XXVII., page 76-81, Mr. Fernald gives a complete history of the founding of the genus *Pontederia* and prefers to retain it, as customarily done, for the *P. cordata*. But if

custom is wrong, custom should be righted. Fernald errs in endeavoring to make binomial nomenclature begin with 1737 instead of 1753 as required by the Vienna Rules (Art. 19). We are not concerned with what Linn may have thought either in 1737 or in 1754, but we are concerned with the Vienna Rules and their proper application to the *Sp. Pl.* (1753) and to the *Gen. Pl. Ed. 5* (1754), as we find them. One of the generic characters is that of a 3-celled and many seeded fruit which Linn certainly did not obtain from *P. cordata*; therefore some other species (*P. hastata*) was equally involved in the generic description. As Linn was no tyro, the inclusion of the fruit characters in the generic description was not the result of chance but of deliberate intention, and as shown by Fernald was a part thereof at all times. As it is a well known fact that Linn had no types we can not say that Linn made either *P. cordata* or *P. hastata* the type of the genus. But one or the other must be construed as typifying the genus under the Vienna Rules. As fruit characters are primarily relied upon to determine the genera of this family of plants, fruit characters under the Vienna Rules (Art. 19) must be used to differentiate the genus; which makes *P. hastata* the type of *Pontederia*. No other conclusion is possible, provided you follow the Vienna Rules. Fernald falls back on Art. 5 to retain *Pontederia* in its customary sense; but again he errs for Art. 5 can not be invoked unless Art. 19 when applied fails to determine the type which, in the present instance, it does not do.

Late second blooming of *Ceanothus Americanus* was observed. Some withered and scorched flowering specimens of summer growth indicated that a fire had killed the early growth and that a second growth and late flowering was the result.

Where the year is not given, it is to be understood that the collectors are Farwell and Gladewitz and the year 1926.

Athyrium Filix-femina (L.) Roth, var. *Michauxii* (Spreng.) Clute. [var. *angustum* (Willd.) Farwell, Mich. Acad. Sci. VI. (1904) 201]. Goodison, No. 5374, Sept. 4,

1919; Farmington, No. 6068, Sept. 28, 1921; Utica, No. 6077, Oct. 5, 1921.

Athyrium Filix-femina var. *commune* (D.C.E.) Farwell. Oxford, No. 5515e, Aug. 22, 1920; Washington, No. 6007c, Sept. 14, 1921; Utica, No. 6077a, Oct. 5, 1921; Newport, No. 6226, July 5, 1922. A form with red stems and veins is *forma rubellum* (Gilbert) Farwell. Rochester, No. 5185, Oct. 6, 1918. Another variation with pinnules wide apart, oblique and decurrent is subv. *elegans* (Gilbert) n. comb. (*A. Filix-femina elegans* Gilbert). Utica, No. 6079, Oct. 5, 1921; Oxford, No. 6119, Oct. 12, 1921.

Potamogeton Illinoensis, Morong. Reported in the "Michigan Flora" from Manistee by F. P. Daniels. The plant, No. 6668, reported previously as *P. amplifolius*, belongs here.

Potamogeton Americanus, C. & S., var. *Novaeboracensis* (Morong) Benn. The plant, No. 4340, previously reported as *P. Americanus*, has the large, thick leaves of this variety and properly belongs here.

Elodea Canadensis Mx. Waterweed. Seldom seen in flower. Detroit R. at Detroit, No. 921a, June 13, 1900. A variety with linear, acute leaves is var. *angustifolia* (Muhl.) n. comb. (*Serpicula verticillata* var. *angustifolia* Muhl.) In Stony Creek at Parkedale, No. 3011, Aug. 4, 1912. Another variation with lance-oblong leaves is var. *Planchonii* (Caspary) n. comb. (*E. Planchonii* Caspary.) In Lake Orion, No. 921, Aug. 29, 1895 and in Lakeville Lake at Lakeville, No. 5328, July 20, 1919.

Bromus ciliatus Linn. A very variable species and many of its variations have been described as species, but the distinctions separating them are only those of degree and not of kind so that it is better to consider them as variations of one highly variable species than as several species. Keweenaw Co., Nos. 562 & 562a, Aug. 16, 1888; Orion, No. 562b, Aug. 29, 1895; Parkedale, No. 2852, July 14, 1912; Detroit, No. 562c, July 22, 1899. A variation with glabrous sheaths is subv. *denudatus* (Wieg.) n. comb. Keweenaw Co., No. 7485½, July 21, 1925. A variation with the lemmas pubescent all over is var. *purgans* (L.) A. Gr. Keweenaw Co., No. 563,

Aug. 26, 1887; Farmington, No. 5087, July 14, 1918; Parkedale, No. 2856, July 14, 1912; Rochester, No. 563a, July 4, 1896; Detroit, No. 683b, Aug. 18, 1907. A variation of this with smooth sheaths is subv. *laevivaginat*us (Wieg.) n. comb. Ypsilanti, No. 5246½, June 15, 1919; Portage Lake, No. 5837, June 12, 1921. A variation with pubescent glumes and overlapping hoary sheaths is var. *incanus* (Shear.) n. comb. (*B. incanus* Hitchc.) Franklin, No. 5161, Sept. 23, 1918; Ypsilanti, No. 5351, Aug. 31, 1919; Detroit, No. 2029, June 30, 1907; Rochester, No. 5194, Oct. 10, 1918; Goodison, No. 5378, Sept. 4, 1919. A variation of this with glabrous sheaths is subv. *latiglumis* (Scribn.) n. comb. (*B. latiglumis* Hitchc.) Detroit, No. 2026, June 30, 1907; Monroe Piers, No. 5570, Aug. 8, 1920; Ann Arbor, No. 7043, Aug. 20, 1924.

Bromus inermis Leyss. In moist grass lands at Geddes, No. 7777, Aug. 25, 1926.

Eragrosti Eragrostis (L.) Karst., var. *megastachya* (Koeler) Farwell, subv. *Leersioides* (Presl.) n. comb. (*Megastachya Leersioides* Presl.) A variation with a more open panicle and with some, often many, smaller, 2-6-flowered spikelets 5 mm. or so long. Shelbyville, No. 5953, July 31, 1921.

Triplasis purpurea (Walt.) Chapm. Sand Grass. This is common on the shores of Lake Erie in Monroe Co. over a stretch of several miles both north and south of Monroe Piers. No. 7799, Sept. 8.

Elymus Virginicus L. var. *hirsutiglumis* (Scribn.) Hitchc. Wild Rye. On the sand beaches of Lake Erie in Monroe township and county. Frequent. Rather small, not over 18 inches high. No. 7797, Sept. 8.

Asperella Hystrix (Linn.) Humb. Porcupine Grass. Common in woods everywhere in southeastern Michigan. Ypsilanti, No. 1174, July 23, 1891; Detroit, No. 1174a, July 21, 1892.

Asperella Hystrix var. *Bigeloviana* Fernald. Credited to Cheboygan Co., Mich. (Ehlers No. 557) by Fernald who points out that the variety does not occur at the same stations where the typical species has been collected. Since the publication of this variety in 1922, I have been looking for it continuous-

ly without success until now; everywhere it has been the typical form with smooth lemmas. Both forms are found at Detroit in the Redford district. No. 7811, Sept. 22.

Aira caespitosa Linn. Hair Grass. In *Rhodora* for Aug. (1926), Mr. Fernald revises this species (under *Deschampsia*) crediting it to this country and Canada in four varieties. The only one found in Michigan is *A. caespitosa* var. *glauca* Hartm. Keweenaw Co., No. 717, Aug. 20, 1889 and No. 6260, June 29, 1923. To this variety he also refers *Baker, Earl and Tracy*, No. 982 from Hamor's Lake, Colorado; the plant under this number in the herbarium of Parke, Davis & Co., certainly is the var. *genuina* Reichb.

Aira flexuosa Linn. This species also occurs in Michigan but probably is less frequent. Keweenaw Co., No. 660, Aug. 16, 1888; Detroit, No. 660a, Oct. 14, 1906.

Sporobolus cryptandrus (Torr.) A. Gr., var. *involutus* Farwell. This variety with included panicles is abundant between Goodison and Orion. No. 7792, Sept. 1; also on the shores of Lake Erie in Monroe township and county, No. 7808, Sept. 8.

Sporobolus vaginiflorus (Torr.) Wood. Rush Grass. Fields at Detroit. Scarce. No. 7898, Sept. 22.

Agrostis stolonifera Linn., var. *stolonifera* (Sm.) Koch, f. *patula* (Gaud.) n. comb. (*A. patula* Gaud.) Similar to the variety but has violet flowers. On Belle Isle, Mich., in shallow water, No. 1811a, Aug. 29, 1903.

Muhlenbergia racemosa (Mx.) B. S. P., var. *ramosa* (Vasey) Beal. Wet fields at Detroit, No. 5624½, Aug. 29, 1920.

Spartina patens (Ait.) Muhl. The Salt Marsh Grass reported in the 19th Annual Report of the Mich. Acad. Sci. as *S. patens* var. *juncea* is not that variety, but is typical *S. patens*.

Panicum subvillosum Ashe. Portage Lake, No. 5847, June 12, 1921; Franklin, No. 5510, June 24, 1920; Washington, No. 5881, June 21, 1921. No. 5236, previously reported as *P. Tennesseeense*, belongs here.

Panicum Tennesseense Ashe. Ypsilanti, No. 5237, June 15, 1919; this was previously reported as *P. Tsugetorum*.

Panicum macrocarpon Torr. No. 7416, previously reported as *P. Liebergii* belongs here.

Panicum virgatum Linn, var. *Cubense* Griseb. A form that seems to fit this variety was collected at Imlay City, No. 6687, Aug. 5, 1923.

Eriophorum spissum Fernald. Cotton Grass. The plants previously reported as *E. vaginatum* vars. *opacum* and *humile* belong here.

Carex triceps Mx., var. *hirsuta* (Willd.) Bailey. According to Beal in Michigan Flora, this sedge is known in Michigan only from one station in Ionia Co. We found it in an oak woods at Scio, which makes a second station. No. 7736, July 21.

Carex gigantea Rudge. (*C. lupuliformis* Sartw.) Excellent specimens of this sedge were collected in a shallow depression in an oak woods at Scio. It was the first time I had seen it in its typical form in Michigan. No 7732, July 21.

Juncus Bogotensis H. B. K., N. Gen. et Sp. Pl., 1 (1815) 235. *J. effusus* Linn., var. *b*. Sp. Pl., Ed. 1 (1753) 326 *J. effusus* Linn, var. *a*, Fl. Suec., Ed. 2, (1755) 111. The modern interpretation of the Linnaean *J. effusus* dates from the Flora Suecica of 1755; this of course is contrary to the Vienna Rules which makes the Sp. Pl., 1753 the beginning of binomial nomenclature. The variety *a* of the latter is the var. *b* of the former and is the species described by Willdenow as *J. arcticus* which name should give way to the older one of Linn. The var. *b* of the Sp. Pl. of 1753 is the var. *a* of the Fl. Suec. of two years later and is the species which has so generally been known under the Linnaean name but which according to the Vienna Rules must be known under the name heading this paragraph. Abundant throughout Michigan in swampy grounds and on the borders of streams. Keweenaw Co., No. 465, Aug. 30, 1886; Detroit, No. 465c, July 10, 1893.

J. Bogotensis var. *compactus* (Lej. & Court.) n. comb. Inflorescence contracted into a small, dense, spherical head. Ke-

weenaw Co., No. 465a, Aug., 1900 and No. 7488, July 21, 1925; Detroit, No. 465b, July 10, 1893.

Cypripedium bulbosum Mill., var. *pubescens* (Willd.) n. comb. (*C. pubescens* Willd.) This is the variety with the largest flower and has the sac compressed vertically giving it the appearance of a "moccasin," hence the name "Moccasin Flower." The three, yellow Ladies' Slippers are undoubtedly conspecific, the oldest name for which is *C. bulbosum* Miller. The typical form is that which was described by DeCandolle as *C. flavescens*, in this the sac is compressed laterally, that is, the force of compression is exerted in a horizontal direction making the sac more bulbous in appearance than is the case in the other forms where the compression is vertical.

Calopogon pulchellus (Salisb.) R. Br. in Ait. f. Hort. Kew. V (1813) 204-5. Grass Pink. In *Rhodora* Vol. XXVII, pages 193-196, Mr. K. K. Mackenzie endeavors to show that the name *Limodorum tuberosum* Linn, Sp. Pl., Vol. 2 (1753) 950 should be used instead of *Calopogon pulchellus* for the Grass Pink. But Mackenzie makes two mistakes: (1) in claiming Linn named and described the species from Clayton's plant No. 76 which he had before him and (2) in ignoring that nomenclature begins in 1753. When Linn drew up his manuscript for *Limodorum tuberosum* for the Sp. Pl., it is extremely doubtful if he even knew that the Clayton specimen was in existence much less having it before him. This manuscript was based upon and taken from publications, not from specimens in Linn's herbarium. True, after the publication of the Sp. Pl., he took that work and went over his herbarium indicating upon the sheets the appropriate species to which they were to be referred; but this can not in any way make such specimens the types of species published in the Sp. Pl. In the publication of *Limodorum tuberosum* L. Sp. Pl. (1753) 950, there is but one description given and this fact alone determines the application of the name, as against other references cited by title only, which may or may not be the same. Also the specific name manifestly is taken from Martyn's description which does require that the

binomial be applied to Martyn's species, Mackenzie to the contrary notwithstanding. The description of the species is from Martyn whose plate 50 also is cited so that "*Limodorum tuberosum* Linn" cannot apply to any other plant than Martyn's no matter what "*Limodorum Gronovius*" Fl. Va. (1739) 110, may have been. The Grass Pink is common in Michigan. It is found in bogs, meadows and even in the moist sand of roadside ditches. Keweenaw Co., No. 490, Sept. 12, 1886; Parkedale, No. 2789, June 30, 1912; Algonac, No. 3689, June 20, 1914; Marl lake, No. 4285, July 9, 1916; Orion, No. 5058, July 7, 1918.

Corallorrhiza maculata Raf. Coral Root. In rocky woods at Copper Harbor. Stems perilla purple, sheaths about the same, some with upper parts brown, No. 7751, Aug. 5, 1926.

Corallorrhiza maculata f. *flavida* (Peck) n. comb. [*C. multiflora* Nutt., var. *flavida* Peck N. Y. State Mus. Rep. L. (1897) 126]. Whole plant yellow except the white lip which may or may not be spotted. Lip unspotted and sheaths yellow, Copper Harbor, No. 7757½, Aug. 5, 1926; lip unspotted, sheaths Van Dyke Brown, capsules mature, Copper Harbor, No. 7750, Aug. 5, '26. Lip spotted, sheaths yellow, Goodison, No. 7788, Sept. 1.

Corallorrhiza maculata f. *intermedia*, n. f. (*C. maculata* var. *intermedia* Farwell; *C. maculata* var. *fusca* Bartlett.) Plant intermediate in color between the typical species and the f. *flavida*, i. e., light cinnamon drab. Rocky woods at Copper Harbor, No. 7749, Aug. 5, 1926; moist woods at Goodison, No. 7787, Sept. 1. With No. 7788. Pitsfield, No. 7829, Sept. 29.

Salix pentandra Linn. Planted largely as a roadside shade tree at Orchard Lake. In good fruiting condition Oct. 6, No. 7846.

Hicoria microcarpa (Nutt.) Britt. Hickory. Orchard Lake. No. 7837, Oct. 6. Previously at Detroit, No. 1628, June 2, 1899; Long Lake, No. 6075, Oct. 4, 1921.

Morus rubra Linn. Red Mulberry. This is a native tree distinguished from the next by its dull, rough leaves, S.

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Rockwood, No. 4790, Oct. 26, 1917; Linden, No. 6665, Aug. 1, 1923.

Morus alba Linn. White Mulberry. An escape near Ann Arbor where young trees are plentiful along fences and on the railway right of way. Fruit purple. No. 7718, July 14. This purple fruited form is frequent at Detroit, No. 3960, May 31, 1915; Grosse Pointe, No. 1821, July 13, 1904. The form with white fruit was collected at Ypsilanti, No. 1116, May 23, 1891; Ann Arbor, No. 7727, July 14, 1926; and at Detroit, No. 7728, July 15, 1926. The var. *Tartarica*, Loudon was collected at Detroit, No. 4869, May 26, 1918 and No. 4959a, June 22, 1918; Monroe Piers, No. 5488, June 30, 1920.

Humulus Lupulus L., var. *Neo-Mexicanus* (Nels. & Cockr.) Rydb. Hops. On banks at Superior, No. 7776, Aug 25, 1926.

Parietaria Pennsylvanica Muhl. Pellitory. In oak woods north of Ann Arbor. No. 7721, July 14.

Commandra umbellata (L.) Nutt. Everywhere on rather dry grounds in open fields or in woods, Keweenaw Co., No. 233, June 20, 1885; Oxford, No. 6522 and Goodison No. 6521, June 6, 1923; Geddes, No. 7377, May 27, 1925; Ann Arbor, No. 7379, May 27, 1925; Algonac, No. 7418, June 17, 1925; Detroit, No. 233a, June 2, 1893 and No. 1893, May 23, 1905.

Commandra Richardsiana Fernald. In similar situations. The following numbers from the color and venation of the leaves apparently belong here. Eagle Harbor, Nos. 6627, 6628, June 29, 1923; Copper Harbor, No. 7756, Aug. 5, 1926; Monroe, No. 7306, April 29, 1925; Eloise, No. 7360, May 20, 1925; Ypsilanti, No. 7366, May 27, 1925; Commerce, No. 7388, June 3, 1925; Nankin, No. 7411½, June 10, 1925.

Polygonum achoreum S. F. Blake. Bluish green. Sepals white-bordered and in fruit some of them are rosy-margined. Large leaves on juvenile plants often attain a size of 3 inches in length (of which 5 lines represent the petiole) and 1.25 inches in width. Moist sandy grounds at Ypsilanti, No. 7775a, Aug. 25, 1926; Detroit, No. 7779, Aug. 26, 1926; Belle Isle, No. 291b, Sept. 3, 1892; Ypsilanti, No. 291a, Sept. 8, 1891; Keweenaw Co., No. 291, Aug. 1, 1885. Collections be-

fore 1926 were made as *P. erectum* which species I have not yet seen from Michigan.

Polygonum dumetorum Linn. f. *cristatum* (Engelm. & Gr.) Robinson. False Buckwheat. This is common on the shores of Lake Erie in Monroe township and county. No. 7805, Sept. 8.

Chenopodium ambrosioides Linn. American Wormseed. At Monroe Piers. This is the first time it has been observed outside of Wayne Co. No. 7796, Sept. 8. Previously collected at Detroit, No. 1959, Oct. 2, 1905, No. 5153, Sept. 20, 1918 and No. 5397, Oct. 15, 1919.

Chenopodium ambrosioides var. *anthelminticum* (Linn) A. Gr. Detroit. No. 1482, Sept. 6, 1894; Birmingham, No. 5215, Oct. 13, 1918.

Salsola Kali Linn. Saltwort. Along railways. Scarce. Pittsfield, No. 7824, Sept. 29.

Amaranthus hybridus Linn. Green Amaranth. Spikes thick and short, erect, obtuse, resembling those of *A. retroflexus* but greener, longer, and not so stiff. Stems yellowish, essentially glabrous. Detroit, No. 7816, Sept. 22. We collected this nearby, Oct. 8, 1924, No. 7247, (see vol 9, p. 268); Royal Oak, No. 4558½, Sept. 8, 1917.

Amaranthus hybridus var. *chlorostachys* (Willd.) Beck. Spikes more slender and elongated with drooping apex, acute. Stems greenish, pubescent. Detroit, No. 1330, Sept. 7, 1892, [see 20th Mich. Acad. Sci. Rept. (1918) 175 where reported as *A. hybridus*] and No. 5136, Sept. 15, 1918; also No. 6380, Aug. 28, 1922; Monroe, No. 6718, Aug. 22, 1923; Marine City, No. 6728, Aug. 29, 1923.

Acnida Tamariscina (Nutt.) Wood. Water Hemp. In railroad yards at Detroit. Looks like *A. tuberculata* from which it can be distinguished only by fruit characters. No. 7899, Sept. 22.

Silene Armeria Linn. Sweet William Catchfly. Shores of Torch Lake at Lake Linden. The petals of these plants are retuse rather than emarginate. No. 7740, Aug. 2, 1926.

Silene latifolia (Mill.) Britten and Rendle. Bladder Campion. The calyx is beautifully veined, often in colors. Spread-

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ing. Lake Linden, No. 7760, Aug. 8, 1926. I have collected it at Detroit, No. 1819, July 5, 1904; Rochester, No. 3877, Sept. 7, 1914; Royal Oak, No. 5585, Aug. 12, 1920; Ypsilanti, No. 5290, July 13, 1920. *Gladewitz and Farwell* have collected it at Oxford, No. 6511, June 6, 1923; Erie, No. 6641, July 11, 1923; Amy, No. 6976½, July 16, 1924.

Stellaria media (Linn) Cyrill, var. *maxima* (Schur) Gürke. Chickweed. A large, fleshy plant resembling *S. aquatica* from which it is distinguished by its three styles. Wet grounds along the shores of Torch Lake at Lake Linden, No. 7741, Aug. 2, 1926. The plant from Redford, No. 4573, previously reported as var. *succulenta* belongs here.

Stellaria media var. *triandra* (Schur) Baguet. A common form in cultivated grounds, weak and straggling, most of the leaves roundish ovate on long ciliated petioles. Lake Linden, No. 7743, Aug. 2, 1926.

Stellaria media var. *Holosteiformis* (Schur) Gürke. Firmer, upright, a foot or so high, most of the leaves ovate-oblong and sessile. Waste grounds, Lake Linden, No. 7742, Aug. 2, 1926.

Anychia Canadensis (L.) B. S. P. Forked Chickweed. In oak woods north of Ann Arbor. No. 7722, July 14.

Actaea alba (L.) Mill. White Baneberry. The pedicels are thick and the mature pods are white. Keweenaw Co., No. 101, June 6, 1884; Walled Lake, No. 4491, June 5, 1917. Red pedicels: Zoo Park, No. 4413, Aug. 27, 1916; Dearborn, No. 5602a, Aug. 15, 1920; Detroit, No. 7809, Sept. 22; Goodison, No. 7786, Sept. 1. The following are green pediceled: Detroit, No. 101a, July 16, 1892; Dearborn, No. 5603, Aug. 15, 1920; Almont, No. 6275b, July 19, 1922; Eagle River, No. 7765, Aug. 11, 1926; Goodison, No. 7784, Sept. 1.

Actaea rubra (Ait.) Willd. Red Baneberry. The pedicels are slender and the mature pods are carmine. Keweenaw Co., No. 102, June 26, 1884; Detroit, No. 102a, May 20, 1893; Walled Lake, No. 4492, June 15, 1917. Red pedicels: Detroit, No. 1461½, June 24, 1894; Farmington, No. 5086, July 14, 1918. Green pedicels: Detroit, No. 1720½, July 2, 1901;

Parkedale, No. 3509, July 20, 1913; Rochester, No. 3723, July 19, 1914.

Actaea rubra f. *neglecta* (Gillm.) Robinson. The pods are white. Redford, No. 5433, May 23, 1920. Pedicels red: Keweenaw Co., No. 781, Aug. 1, 1890; Detroit, No. 781a, Sept. 10, 1896. Pedicels green: Eagle River, No. 7764, Aug. 11, 1926.

Actaea rubra var. *gigantea* Gates. Merely a large form and being based entirely upon size, it is not worth being maintained. Plants as high as 38½ inches. Goodison, No. 7785, Sept. 1 (red pedicels).

Berberis Thunbergii DC. Barberry. The cultivated form has brown branches. Found as an escape north of Ann Arbor, but in this wild situation the branches are green. No. 7724, July 14.

Alyssum Alyssoides (L.) Gouan f. *albineum* n. f. The typical form of the species has yellow flowers fading white. This form has white flowers. Waste places at Shelbyville, No. 6579, June 21, 1923.

Erysimum Irio (L.) n. comb. [*Sisymbrium Irio* Linn, Sp. Pl. (1753) II, 659]. London Rocket. In waste grounds at Detroit, No. 7730, July 19, 1926. Rare.

Erysimum Loesellii (L.) n. comb. [*Sisymbrium Loesellii* Linn, Amoen. Acad. (1759) IV, 279]. With the preceding. No. 7731, July 19, 1926. The first species is glabrous and has the young pods overtopping the flowers. This is hispid and has the young pods shorter than the flowers.

Raphanus sativus Linn. Radish. Waste grounds, Ypsilanti, No. 7774, Aug. 25, 1926.

Heuchera hirsuticaulis (Wheelock) Rydb. Alum Root. Hill-sides at Scio. Just passing out of its flowering season. Not included in Beal's Michigan Flora. Scio, No. 7738, July 21. Other stations are Wiard, No. 2159, June 25, 1910; Parkedale, No. 2744, June 23, 1912; LaSalle, Farwell and Gladewitz, No. 5766, June 2, 1921.

Mitella diphylla Linn, f. *triphylla*, Rosendahl. This form with a third sessile leaf on the scape between the usual op-

posite pair and the inflorescence was collected at Redford, No. 4852, May 24, 1918.

Mitella diphylla Linn, f. *efoliata* n. f. Scape without leaves or with minute vestiges of them. In copses at Bloomfield, No. 4866, May 25, 1918.

Spiraea tomentosa Linn, var. *rosea* (Raf.) Fernald. Hardhack. All that I have seen of this species from Michigan belongs to this variety. Royal Oak, No. 4326, July 13, 1916 and No. 5592a, Aug. 12, 1920; LaSalle, No. 6285, July 26, 1922; Detroit, No. 1545, July 23, 1896; Dead Lake, No. 1545a, July 10, 1910.

Potentilla Pensylvanica Linn. Five Finger or Cinquefoil. Torrey and Gray say it does not occur in the U. S. east of the Mississippi river. Dr. Beal admitted it to the "Michigan Flora" on the strength of Gray's Manual which cites "Lake Superior." It was not here in the '80's when I lived here nor as late as in 1915; but it has appeared sometime since the last named date. Britton, also Rydberg, says the styles, thickened and glandular at the base, are not longer than the mature glabrous achenes. In these plants the styles are $\frac{1}{2}$ as long again as the achenes. They have tap roots with caespitose crown. The stems are appressed pubescent; the leaves grayish pubescent beneath, green above with more or less appressed hirsutenes. The leaves are old pinnate with 5-9 leaflets, the leaflets approximate and subdigitate or remote, usually opposite but sometimes alternate; leaves of the stem usually small and pentagonal, the lowermost and the basal similar or larger and obovate from the more remote leaflets. The obovate leaflets are pinnatifid to near the midrib with oblong or linear, obtuse lobes, distinctly revolute, the larger leaflets are often 3 inches long by 1 inch wide, often with 1 or 2 teeth on the outer margin of the lobes. Plentiful over a stretch of ground 200 yards in length by 40 wide; cattle had browsed upon most of it. Clifton, No. 7769, Aug. 11, 1926.

Rubus strigosus Mx. Red Raspberry. Abundant on the Keweenaw Peninsula. This has bristly glandular calyx lobes and a bristly brownish somewhat glaucous stem; leaves ser-

rate. Keweenaw Co., No. 263, July 15, 1885; Detroit, No. 263a, July 10, 1893.

Rubus Phoenicolasius Maxin. Wineberry. This has a glaucous, reddish stem with long reddish, more or less glandular hairs, and the leaves are apiculately crenate. Roadsides at Goodison, No. 7780, Sept. 1; previously at Trenton, No. 5784, May 26, 1921; Detroit, No. 3372, May 24, 1913.

Rubus neglectus Peck. Purple Raspberry. Much like the Red Raspberry but the stems are purple and glaucous and the fruit is purplish red. Low grounds, Pittsfield, No. 7836, Sept. 29; previously at Northville, No. 6465, Oct. 18, 1922; Marl Lake, No. 5713, Sept. 18, 1920; Detroit, No. 1403, July 25, 1893.

Rubus occidentalis Linn. Black Raspberry. Stems are densely white glaucous and prickly with stout hooked, prickles. Fruit black. Dearborn, No. 7507, Aug. 6, 1925, reported as *R. neglectus* belongs here. Ypsilanti, No. 1120, May 29, 1891; Detroit, No. 1120a, June 6, 1893 and No. 3373, May 24, 1913; Parkedale, No. 2681, June 11 and No. 2943, July 28, 1912.

Rosa acicularis Lindl., var. *Sayiana* Erlanson. Prickly Rose. Previously reported as *R. Engelmanni* S. Wats. It is abundant on the Keweenaw Peninsula. The fruit is pear shaped, often with a very long, tapering base, and frequently tapering to the apex. Vaughnsville, No. 779, Aug. 1, 1890; Eagle Harbor, No. 7580, Aug. 5, 1925; Copper Harbor, No. 7755, Aug. 5, 1926.

Rosa acicularis var. *rotunda* Erlanson. Abundant on the Keweenaw Peninsula. It heretofore has been reported as var. *Bourgeauiana*. The fruits are sometimes flask shaped. Clifton, No. 187, Aug. 22, 1884, and No. 7482, July 21, 1925; Copper Harbor, No. 1614a, Aug. 24, 1898 and No. 7754, Aug. 5, 1926; Eagle River, No. 7486a, July 21, 1925.

Rosa acicularis var. *Bourgeauiana* Crepin. Abundant on the Keweenaw Peninsula. Heretofore reported as *R. acicularis* Lindl. Copper Harbor, No. 5970, Aug. 16, 1921, and Nos. 7753, Aug. 5, 1926; Eagle Harbor, No. 7581, Aug. 15, 1925.

Rosa suffulta Greene. A large stand of this rose was

found north of Ann Arbor on dry ground near the railroad tracks. No. 7726, July 14.

Rosa cinnamomea Linn. Cinnamon Rose. Persistent and spreading. A double flowered form. In the rear of my home at Clifton, back in the eighties, was a well-kept small garden composed of cherries, currants, strawberries and perhaps a half dozen plants of this rose. Today there is no sign or indication of this garden except this rose and some cherry tree stumps. The old garden has disappeared and has been converted into an excellent green pasture or grassy field. The roses probably have had no cultural attention for more than a quarter century but have spread until they have formed a dense stand of several score plants. No. 7770, Aug. 11, 1926.

Pyrus Arbutifolia (Linn.) Linn f. Chokeberry. Fruit small red, 2-3 lines in diameter. Leaves densely tomentose beneath, obovate or oblanceolate, 0.75 to 3.00 by 0.375 to 1.625 inches, abruptly short acute. A single shrub, about 6 feet in height, with two or three slender stems. In a Tamarack swamp at Orchard Lake. This is the first time that I have detected the typical form of the species in Michigan. No. 7811, Oct. 6. In the herbarium of Parke, Davis & Co., there is a plant from Eustis, Fla., G. V. Nash, No. 3, March 12-31, 1894 which has smaller, oval or oblong leaves (1.25-1.75 by 0.5-0.75 inches) broadly rounded at the apex which may be known as *Pyrus Arbutifolia* var. *oblongifolia*, n. var.

Pyrus arbutifolia var. *atropurpurea* (Britt.) Robinson. The leaves are much as in the species but nearly glabrous beneath. Fruit larger (4-5 lines in diameter) and purple. In the same swamp, but frequent. No. 7845. This variety is abundant but not so much so as *P. melanocarpa* (Mx.) Willd. which has glabrous leaves of the same shape but somewhat smaller and black fruit intermediate in size (3-4 lines.)

Crataegus straminea Beadle. (*C. apposita* Sarg.) Thorn Apple. An irregularly topped shrub 4 to 8 feet high. At this time the fruit was green but about fully grown, mostly single but with an occasional cyme of 4 or 5 fruits which looked more like umbells than cymes. The calyx lobes are mostly deciduous, only a very few fruits were seen that were

still capped with their calyx lobes. Scio, No. 7735, July 21.

Crataegus coccinea Linn, var. *Ellwangeriana* (Sarg.) Eggl. Frequent in fields at Detroit, No. 7820, Sept. 22.

Melilotus Melilotus-officinalis (L.) Farw. Yellow Sweet Clover. The typical form with upright stems and divergent branches. Pittsfield, No. 7833, Sept. 29.

Linum usitatissimum Linn. Flax. Roadsides, Ypsilanti, No. 7775, June 25, 1926.

Euphorbia dentata Mx., var. *lancifolia* Farw. Railway banks, Pittsfield, No. 7830, Sept. 29.

Impatiens aurea Muhl. Yellow Jewelweed. In moist, shady grounds along the shores of Lake Erie in Monroe township. No. 7804, Sept. 8. Previously collected at Detroit, No. 1871, Sept. 9, 1904, and at Galesburg, No. 5554, July 20, 1920.

Impatiens biflora Walt. Jewelweed. Similar situations and with the last, but also in more open places, often on the sand beach. No. 7803. Previously collected in Keweenaw Co., No. 366, June 1, 1886; at Detroit, No. 366a, July 16, 1892; Parkedale, No. 2945, July 28, 1912 and No. 3145, Sept. 2, 1912; Calumet, No. 3094, Aug. 26, 1912.

Impatiens biflora Walt., f. *immaculata* C. A. W. On the sand beach of Monroe township. Rare. No. 7802, Sept. 8.

Impatiens Balsamina Linn. Balsam. An escape to waste grounds at Detroit, No. 1596, Sept. 4, 1897.

Ceanothus Americanus L. New Jersey Tea. Both flowers and fruit were abundant. Pittsfield No. 7822, Sept. 29.

Malva sylvestris Linn. High Mallow. On the shores of Torch Lake at Lake Linden. Scarce. No. 7772, Aug. 14, 1926.

Gentiana flavida A. Gr. Fields at Pittsfield, No. 7831, Sept. 29.

Acerates viridiflora, Ell., var. *lanceolata* (Ives) A. Gr. Green Milkweed. Grassy fields, Pittsfield, No. 7826, Sept. 29.

Monarda fistulosa L., f. *albescens* Farwell. A new station for this white flowered form was discovered at Goodison. No. 7790, Sept. 1.

Solanum Dulcamara L., var. *pubescens* R. & S. We found

a stand of this variety with exceptionally dense pubescence throughout at Scio. No. 7733, July 21.

Lycopersicon Lycopersicum (L.) Farwell, var. *commune* (Bailey) n. comb. [*L. esculentum* Mill., var. *commune* Bailey, Man. Cult. Plants (1924) 656]. Tomato. This seems to be well established and naturalized on the shores of Lake Erie in Monroe township and county; it is frequent along several miles of wild coast, ripening considerable fruit. No. 7800, Sept. 8, 1926.

Verbascum Blattaria L., f. *albiflorum* (O. K.) n. comb. Flowers white with a tinge of purple. As this is only a color variation it should rank as a form. Pittsfield, No. 7823, Sept. 29.

Tecoma radicans (L.) DC. Trumpet Flower. This is quite common in cultivation near houses and fences. A number of plants were found on the banks of the Ann Arbor railroad where they are a natural escape from cultivation, the first time observed away from the influence of a house or garden. No. 7717, July 14.

Lonicera Morrowii A. Gr. A cultivated species of honeysuckle at Grosse Pointe. In July 1 was given a sample of a fruiting honeysuckle with the information that a two years old son of Mr. Glenn Howland of Grosse Pointe had made a meal out of the berries of the shrub. The result of eating a quantity of the fruit was the appearance on the boy of a copious rash or urticaria which disappeared again in due course leaving no bad after effects. The specimen proved to be of this species. The plant, No. 7364, from Ypsilanti previously reported as of this species is *L. Xylosteum* L. Other species that are suspected are *L. crysantha*, *L. involucrata*, *L. japonica*, *L. Tartarica*, *L. tomentella* and *L. Xylosteum*.

Lobelia Kalmii L., var. *capillaris* n. var. Stem simple, slender, weak, capillary, lower leaves linear-oblongate, three quarters of a line wide, uppermost usually filiform, flower usually one, smaller (3 to 4½ lines) and paler than in the species. Wet grassy meadows near Goodison, No. 7794, Sept. 1.

Sicyos angulatus L. Bur Cucumber. Common along the

sand beaches of Lake Erie in Monroe township and county. No. 7798, Sept. 8. A few plants each of some species of *Citrullus* and of *Cucurbita* were observed, probably *Cit. vulgaris* and *Cuc. Pepo*.

Solidago caesia Linn. Goldenrod. A handsome, paniculately branched species of dry deciduous woods. Frequent. Orion, No. 917, Aug. 29, 1895; Oxford, No. 4725, Oct. 11, 1917; Utica, No. 6094, Oct. 5, 1921.

Solidago caesia var. *axillaris* (Ph.) A. Gr. Stems simple, inflorescence consists of small glomerules in the axils of the leaves. Frequent. Orchard Lake, No. 7838, Oct 6. Previously at Oxford, No. 4726, Oct. 11, 1917; Utica, No. 6095, Oct. 5, 1921.

Solidago bicolor L., var. *concolor* T. & G., f. *ramosior* Farwell. Roadsides at Goodison. No. 7782, Sept. 1. This has been observed at Rochester.

Solidago pulcherrima A. Nelson. Dry soils. Pittsfield, No. 7828, Sept. 29.

Aster sagittifolius Weden., var. *glomerellus* n. var. Stems red, glabrous, about a yard in height, leaves rough on both sides, ovate lanceolate, sagittate or cordate, on broadly margined petioles, the upper lanceolate, tapering into the broadly margined petiole or sessile, inflorescence, usually more than half the plant, reduced to small glomerules in the axils of the leaves generally less than the length of the leaf; rays white. It looks much like a reduced form of the var. *urophyllus* but the leaves are rough underneath instead of pilose. Abundant. Pittsfield, No. 7821, Sept. 29, 1926. Typical *A. sagittifolius* with paniculate inflorescence and blue rays is scarce in southeastern Michigan; collected at Redford district of Detroit, No. 7810, Sept. 22. The common form here is the white rayed variety *urophyllus* with a narrow thyrsoid inflorescence of both terminal and axillary elements. The differences appear to be specific and I would restore it to specific rank as *A. urophyllus* Lindl. The above described variety would then be *A. urophyllus* var. *glomerellus*.

Helianthus giganteus Linn, var. *resiniferus* n. var. The lower surfaces of the leaves are copiously covered with large,

yellow, resinous globules. In low, wet grounds at Parkedale, near Rochester, No. 3846, Aug. 23, 1914.

Helianthus giganteus Linn, var. *verticillatus* n. var. The leaves on the upper part of the stem are arranged in whorls. Shores of Marl Lake near Orion, No. 4369, Aug. 13, 1916.

Cirsium undulatum (Nutt.) Spreng., forma *album* n. f. Flowers white. The typical species has reddish purple flowers but as these flowers are pure white the plant may receive a formal name as a color variation. North of Ann Arbor, No. 7725, July 14.

Centaurea Cyanus Linn. Bachelor's Button. Waste grounds, Ypsilanti, No. 7773, Aug. 25, 1926.

Sonchus arvensis L., var. *maritimus* Wahl. Sow Thistle. Pittsfield, No. 7834, Sept. 9.

Sonchus oleraceus Linn. Sow Thistle. There are three distinct varieties of this species as to leaf form. The typical form has a runcinate leaf with broad lateral lobes, the terminal larger, suborbicular. Marine City, No. 6725, Aug. 29, 1923. Var. *lucerus* (Willd.) Wallr. has pinnatifid leaves, all the lobes narrower lanceolate and subequal. Marine City, No. 6724a, Aug. 29, 1923. Var. *integrifolia* Wallr. has entire leaves, the upper oblong, oval or lanceolate, the lower with a large terminal deltoid lobe and a broadly winged midrib usually without lobes. Marine City, No. 6723a, Aug. 29, 1923.

Hieracium umbellatum Linn. var. *scabriusculum* n. var. Lower part of stem more or less hispid, upper part puberulent, uppermost part and peduncles canescent, leafy up to the inflorescence, leaves not reduced in size; involucre pubescent. This is the plant that has passed current as *H. umbellatum* L. or *H. scabriusculum* Schwein. Such European specimens of *H. umbellatum* as I have seen have the leaves on the upper parts of the stems reduced to small bracts, the involucre is glabrous, and the stems are much less pubescent above and usually glabrous below. Frequently the uppermost part of the stem is leafless, giving the inflorescence the appearance of being peduncled. Our plant would appear to be a good geographical variety. Copper Harbor, No. 7748, Aug. 5, 1926.

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ON THE DIVISION OF THE SPHAERIIDAE INTO TWO
SUBFAMILIES: AND THE DESCRIPTION OF A
NEW GENUS OF UNIONIDAE, WITH DES-
CRPTIONS OF NEW VARIETIES.*

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In 1895, Dall called attention to the difference in siphonal arrangement between *Sphaerium* and *Pisidium*, and said "If this is found by more extensive observation to be constant within the genera the family might be divided into two subfamilies (Wagner Free Inst. Sci., III, p. 540). The examination of upward of a hundred species of these two genera, together with many species of *Musculium*, seem to attest the accuracy of Dall's suggestion and the propriety of separation into two groups or subfamilies. Hannibal (Proc. Mal. Soc. London, X, p. 133, 1912) has instituted a family *Corneocycladidae* for the small clams known as *Pisidium*, but the name will have to be ignored since no characteristics of importance are given in the diagnosis.

Subfamily SPHAERIINAE Nov.

A distinct anal and branchial siphon; anterior end shorter than posterior end.

This group will include the genera *Sphaerium*, *Musculium*, and *Eupera*.

Subfamily PIDIDINAE Nov.

Anal siphon only developed, the branchial siphon being represented by the mantle cleft; anterior end longer than posterior end.

This group includes the genus *Pisidium*. The foot of *Pisidium* differs from that organ in the *Sphaeriinae* in being

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larger in proportion to the size of the animal, more tongue-shaped, and capable of great extension. It is used for burrowing in the sand or mud of the bottom or for crawling over vegetation or debris on the bottom. *Pisidium* has been collected from algae far above the bottom, associated with *Amnicola* and *Gyraulus*.

In 1916, Utterback (*Naiades of Missouri*, p. 104) included *Anodonta imbecillis* in the genus *Lastena* under the Rafinesquian name of *Lastena ohioensis*. Ortmann in 1919 (*Mem. Carnegie Mus.*, VIII (p. 162) and Ortmann and Walker, in 1922 (*Occ. Papers, Mus. Zool., Univ. Mich.* p. 37), have shown that this name cannot be used for the species, and genus, the name *Lastena* having been correctly diagnosed and a type fixed by Simpson in 1900 (*Proc. U. S. Nat. Mus.*, XXII, p. 654).

As indicated by Utterback, however, the species *Anodonta imbecillis* differs in several particulars from the other members of the genus *Anodonta* and it should be recognized as a distinct group of the *Anodontinae*. The shape of the umbones is quite different, no *Anodonta* having such flattened beaks. The animal is hermaphroditic and there is no parasitic stage in the development of the glochidium, the process taking place in the marsupium and the young mussel discharged when ready to begin independent life. These characters differentiate *imbecillis* from all other *Anodonta* at present known. I would, therefore, designate the group as Genus *Utterbachia* Nov., with *Anodonta imbecillis* as the type.

It is probable that when the various types of shell referred to this genus are critically examined from all parts of its range there will be found differences of specific or varietal importance. Its present known range is from southern Michigan and Wisconsin south to Mexico, east to western New York and west to Kansas and Oklahoma. Typically, *imbecillis* is a river form being particularly abundant in small streams where there is a muddy bottom, where it is usually buried from sight.

Utterbackia imbecillis fusca Var. Nov.

Shell differing from typical *imbecillis* in being smaller, more cylindrical, shorter in relation to height, valve less swollen in the center of the disc, and color shades of brown with rarely yellowish rays on an olive background.

L. 48; H. 25; D. 14 mm. Holotype. Univ. Wis. Coll., 927a.

L. 43; H. 21; D. 11 mm. Paratype. Univ. Wis. Coll., 927b.

Type locality: Sturgeon Bay, Door Co., Wis. Types Univ. Wis., 927a-c.

This variety of *imbecillis* occurs on the open shore of Sturgeon Bay below the city. The bottom in this region is of sandy-clay, more or less marly, and with some *Chara*. It appears to be a dwarfed form of *imbecillis* produced, probably, by its habitat in a turbulent bay, certainly a markedly different environment from the quiet reaches of a small, mud-bottomed stream.

Anodonta henryana Lea, described from Matamoras and Tamaulipas, Mexico, is a member of the genus *Utterbackia* and probably a distinct species. It is in the Hinkley collection of the University from San Rafael, Texas. A form of *imbecillis* from Alabama may be a variety, but not enough material is at hand to determine this question.

Carunculina parva cahni Nov. Var.

Shell differing from typical *parva* in being larger, more inflated, with heavier hinge teeth. It is well rounded at both ends and there is not the distinct difference due to sex shown in *parva*. The beak sculpture is very heavy.

L. 45.5; H. 25.5; D. 25.0 mm. Type. (U. I. Z17341).

L. 41.0; H. 24.0; D. 22.0 Paratype. (U. I., Z17342).

Type locality: Neosha mill pond, Dodge Co., Wis. Types in Univ. Ill Mus. Nat. Hist., Z17341, Z17342. Also collected in Lake Koshkonong, Jefferson Co., Wis.

This form of *parva* is so distinct from the usual small, more or less compressed form of the species, as found in Wisconsin and Illinois, that it should be designated as a variety. Typical *parva* has a width index of 40-50% while *cahni* has an index of 50-55%. It appears to be a pond or lake form, typical *parva* being a river form, and the distinction may be

largely one of ecology. The specimens were collected by Dr. Alvin R. Cahn, of the Department of Zoology, University of Illinois, to whom the variety is dedicated.

Lampsilis siliquoidea pepinensis Var. Nov.

Shell differing from typical *siliquoidea* in being comparatively shorter and higher, of much greater diameter with a more marked posterior slope, a thicker, heavier shell and more massive pseudocardinal teeth. The surface is usually marked with bright green rays with marked intensity.

L. 94; H. 58; D. 39 mm. Male. Paratype.

L. 77; H. 52; D. 48 mm. Female. Holotype.

L. 87; H. 52; D. 38 mm. Male. Holotype.

Type locality: Lake Pepin, near Lake City, Minn. Collected by Mr. Geo. Wagner. Types in Univ. Wis., Coll., 354, 355, 361.

The *siliquoidea* from Lake Pepin are peculiar in having the valves of the shell very thick and heavy and in being greatly inflated, the female often being almost globular in extreme forms. This form has long been known among mussel fishermen as the "Lake Pepin mucket" and it seems quite appropriate that a scientific name should be given to so marked a variety. It, like many other of the naiades, is a response to lake conditions acting on a river species. The form appears to ascend the St. Croix River as far as Osceola above which the form appears to again resume the *siliquoidea* condition. The material examined, which has been quite ample, shows little variation from the form as indicated in the above diagnosis.



